

HP StorageWorks XP24000/XP20000 Snapshot User Guide

Abstract

This guide explains how to use HP StorageWorks XP Snapshot Software to create space-efficient point-in-time copies of data volumes on an HP StorageWorks XP24000/XP20000 storage system. Topics include creating, monitoring, and troubleshooting snapshot pools, virtual volumes, and copy pairs. The intended audience is a storage system administrator or authorized service provider with independent knowledge of HP StorageWorks XP storage systems and Remote Web Console.



© Copyright 2007, 2011 Hewlett-Packard Development Company, L.P.

Confidential computer software. Valid license from HP required for possession, use or copying. Consistent with FAR 12.211 and 12.212, Commercial Computer Software, Computer Software Documentation, and Technical Data for Commercial Items are licensed to the U.S. Government under vendor's standard commercial license.

The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Acknowledgments

Windows is a U.S. registered trademark of Microsoft Corporation.

ShadowImage and TrueCopy are registered trademarks of Hitachi, Ltd. and Hitachi Data Systems Corporation.

UNIX is a registered trademark of The Open Group.

Export Requirements

You may not export or re-export this document or any copy or adaptation in violation of export laws or regulations.

Without limiting the foregoing, this document may not be exported, re-exported, transferred or downloaded to or within (or to a national resident of) countries under U.S. economic embargo, including Cuba, Iran, North Korea, Sudan, and Syria. This list is subject to change.

This document may not be exported, re-exported, transferred, or downloaded to persons or entities listed on the U.S. Department of Commerce Denied Persons List, Entity List of proliferation concern or on any U.S. Treasury Department Designated Nationals exclusion list, or to parties directly or indirectly involved in the development or production of nuclear, chemical, biological weapons, or in missile technology programs as specified in the U.S. Export Administration Regulations (15 CFR 744).

Revision History

Edition	Date	Description
First	June 2007	This edition applies to microcode version 60-01-31-00/00 or later.
Second	September 2007	This edition applies to microcode version 60-01-68-00/00 or later.
Third	November 2007	This edition applies to microcode version 60-02-04-00/00 or later.
Fourth	January 2008	This edition applies to microcode version 60-02-25-00/00 or later.
Fifth	April 2008	This edition applies to microcode version 60-02-48-00/00 or later.
Sixth	June 2008	This edition applies to microcode version 60-03-04-00/00 or later.
Seventh	September 2008	This edition applies to microcode version 60-03-24-00/00 or later.
Eighth	December 2008	This edition applies to microcode version 60-04-04-00/00 or later.
Ninth	February 2009	This edition applies to microcode version 60-04-13-00/00 or later.
Tenth	June 2009	This edition applies to microcode version 60-05-00-00/00 or later.
Eleventh	June 2010	This edition applies to microcode version 60-07-00-00/00 or later.
Twelfth	May 2011	This edition applies to microcode version 60-08-01-00/00 or later.

Contents

1 Overview of HP StorageWorks XP Snapshot Software.....	6
XP Snapshot.....	6
Features.....	6
Benefits.....	6
Differentiation from HP StorageWorks XP Business Copy Software.....	7
2 About XP Snapshot Operations.....	8
XP Snapshot Components.....	8
Volumes and Volume Pairs.....	8
Volume Pairs and Consistency Group.....	8
XP Snapshot Software.....	8
License.....	8
RAID Manager.....	9
XP Snapshot Operations.....	9
Create V-VOL Management Area Operation.....	10
Creation of a Pool.....	10
Creation of a Virtual Volume.....	11
Creation of an XP Snapshot Pair.....	12
Storing XP Snapshot Data.....	12
Restoration of an XP Snapshot Pair.....	13
Deletion of XP Snapshot Data or an XP Snapshot Pair.....	13
Status of the XP Snapshot Pairs.....	14
Copy Threshold Option.....	25
Interoperability with Other Products and Functions.....	26
Data Retention Utility.....	27
Auto LUN.....	27
XP Business Copy.....	27
XP Continuous Access or XP Continuous Access Journal.....	30
HP StorageWorks XP Thin Provisioning Software.....	32
3 Preparing for XP Snapshot Operations.....	33
System Requirements.....	33
Volume Requirements.....	33
XP Snapshot Software Requirements.....	35
License Requirements.....	35
Shared Memory Requirements.....	35
Requirements for RAID Manager.....	35
Operational Requirements.....	35
Calculating the Maximum Number of Pairs.....	36
Calculating the Number of XP Snapshot Pairs by Using the Number of Differential Tables.....	36
Calculating the Number of XP Snapshot Pairs by Using the Shared Memory Capacity for the Virtual Volume Management Area.....	37
Calculating the Number of XP Snapshot Pairs Using the Number of Pair Tables.....	39
Performance Considerations.....	40
Notes on Defining Pool Capacity.....	40
Notes on Using External Volumes as Pool-VOLs.....	41
Requirements for Maintaining XP Snapshot.....	41
Notes on Replacing the Microcode Offline.....	41
Notes on Switching Off the Power Supply.....	41

Installing and Uninstalling XP Snapshot.....	42
Installing XP Snapshot.....	42
Uninstalling XP Snapshot.....	42
Starting XP Snapshot.....	42
4 Using the XP Snapshot GUI.....	44
Pair Operation Window.....	44
Volume List.....	46
Preview List.....	49
History Window.....	51
XP Snapshot Window.....	53
Pool Window.....	56
V-VOL Window.....	63
5 Performing XP Snapshot Operations.....	66
XP Snapshot Processes.....	66
Configuring the Volume List.....	67
Deleting the Settings in Preview List.....	69
Creating or Deleting Pools.....	69
Creating New Pools.....	69
Changing the Information for the Pools.....	71
Deleting Pools.....	72
Deleting a Pool.....	72
Deleting Multiple Pools.....	73
Optimizing the V-VOL Management Area or Pool Management Block.....	73
Optimizing the V-VOL Management Area.....	73
Optimizing the Pool Management Block.....	74
Creating or Deleting Virtual Volumes.....	74
Creating New Virtual Volumes.....	74
Deleting Virtual Volumes and a Virtual Volume Group.....	83
Deleting Multiple Virtual Volume Groups	83
Creating XP Snapshot Pairs.....	85
Storing XP Snapshot Data.....	85
Storing XP Snapshot Data by Consistency Group with At-Time Snapshot Function.....	86
Restoring XP Snapshot Pairs.....	88
Deleting XP Snapshot Data.....	88
Deleting XP Snapshot Pairs.....	89
Deleting XP Snapshot Pairs by Selecting the Pairs per Port.....	89
Deleting XP Snapshot Pairs by Selecting the Pairs per Pool.....	91
Viewing Detailed Volume and Pair Information.....	91
Viewing S-VOL Path Information.....	93
Viewing the Number of Pairs and License Information.....	94
Displaying the Operation History.....	96
6 Troubleshooting.....	98
Procedure to Recover a Blocked Pool.....	101
Procedure to Complete the Pool-Related SIMs.....	102
Troubleshooting When Using XP RAID Manager.....	103
7 Support and other resources.....	116
Contacting HP.....	116
HP technical support.....	116

Subscription service.....	116
Documentation Feedback.....	116
Related information.....	116
Websites.....	117
Conventions for storage capacity values.....	117
Typographic conventions.....	117
Glossary.....	119
Index.....	121

1 Overview of HP StorageWorks XP Snapshot Software

This chapter provides an overview of XP Snapshot and describes the features and benefits of XP Snapshot.

- “XP Snapshot” (page 6)
- “Features” (page 6)
- “Benefits” (page 6)
- “Differentiation from HP StorageWorks XP Business Copy Software” (page 7)

Unless otherwise specified, the term *storage system* in this guide refers to the following disk arrays:

- HP StorageWorks XP24000 Disk Array
- HP StorageWorks XP20000 Disk Array

The GUI illustrations in this guide were created using a Windows computer with the Internet Explorer browser. Actual windows may differ depending on the operating system and browser used. GUI contents also vary with licensed program products, storage system models, and firmware versions.

XP Snapshot

The XP Snapshot feature of the HP storage system rapidly creates logical point-in-time snapshot copies of data volumes within the storage system, or behind the storage system as external storage, without impacting host service or performance levels. XP Snapshot accelerates backup and recovery processes by reducing the amount of disk storage required for the snapshot copies. Because only the changed data blocks are stored in the XP Snapshot storage pool, the snapshot copy is substantially smaller than the source, saving a significant amount of storage capacity over full cloning methods. XP Snapshot’s capability for quick restoration of data reduces traditional, tape-based application restore time from hours to seconds.

Features

The key features of XP Snapshot are:

- Point-in-time copies of only changed blocks in the XP Snapshot data pool, not full volume.
- Instantaneous restore of just the data you need.
- Versioning of backups for easy restore.
- RAID protection of all XP Snapshot copies.
- Near-instant copy creation and deletion.
- Easy integration with industry-leading backup software applications.

Benefits

XP Snapshot provides the following business benefits:

- Reduces recovery time from data corruption or human error considerably via an immediate restore from a disk-resident, point-in-time data snapshot copy.
- Allows frequent data backup operations to be performed nondisruptively, while critical applications run unaffected.
- Accelerates application testing and deployment by providing always-available copies of current production information.
- Enables immediate access to time-critical information.
- Eliminates the backup window.

- Improves operational efficiency by allowing multiple processes to run in parallel with access to the same information.
- Allows disk space to be used efficiently through volume snapshots rather than full-copy clones, which helps maximize disk space.

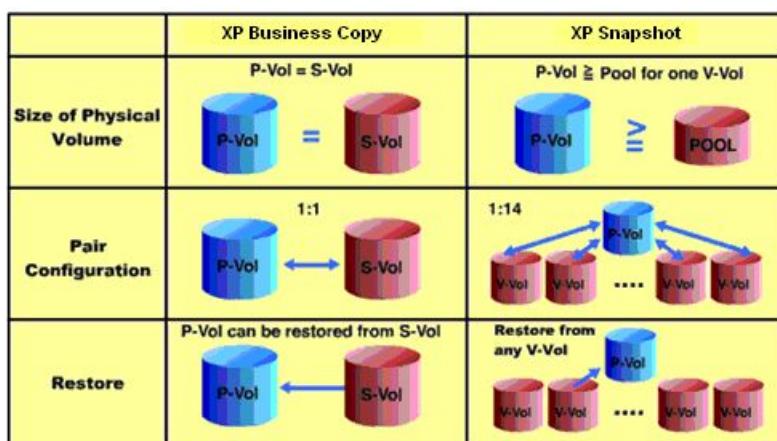
Differentiation from HP StorageWorks XP Business Copy Software

XP Business Copy differs from XP Snapshot in that it creates physically separate copies of the data; no portion is shared between primary and secondary volumes. [Table 1 \(page 7\)](#) highlights the key differences between the XP Snapshot and XP Business Copy products.

Table 1 XP Snapshot and XP Business Copy Differentiators

	XP Snapshot Virtual Volume	XP Business Copy Clone
Features	Provides a very quick copy because it is a virtual volume	Superior protection because it is a complete copy Immediate restore if P-VOL becomes corrupted
Time to Create	Instantaneous	From minutes to hours, depending on the size of the P-VOL
Disk Space Used	Size will vary depending upon the amount of data changed	Same amount as P-VOL
Data Recovery Time After P-VOL is corrupted	Two-stage restore: 1. V-VOL verify, data not available to host 2. Copy back from a tape storage or other, data available	Instantaneous
Size of Physical Volume	P-VOL \geq Pool for one V-VOL	P-VOL = S-VOL
Pair Configuration	P-VOL : V-VOL = 1 : 64	P-VOL : S-VOL = 1 : 3
Restore	P-VOL can be restored from any V-VOL	P-VOL can be restored from S-VOL

Figure 1 Product Differentiators for XP Snapshot and XP Business Copy Software



2 About XP Snapshot Operations

This chapter describes the volumes used by XP Snapshot and the functions of XP Snapshot.

- “XP Snapshot Components” (page 8)
- “XP Snapshot Operations” (page 9)
- “Status of the XP Snapshot Pairs” (page 14)
- “Copy Threshold Option” (page 25)
- “Interoperability with Other Products and Functions” (page 26)

XP Snapshot Components

A system using XP Snapshot usually contains the following components.

- Pair of volumes (P-VOL and S-VOL)
- Consistency group
- XP Snapshot program product
- Licensed XP Business Copy program product
- XP RAID Manager

Volumes and Volume Pairs

XP Snapshot copies the original data in a P-VOL to a V-VOL. A V-VOL is specified as an S-VOL and manages a P-VOL. A P-VOL is the logical volume and an S-VOL, which is the V-VOL, is the volume for an XP Snapshot pair.

- A virtual volume of XP Thin Provisioning Software can be specified as a logical volume, but a virtual volume of XP Snapshot should not be specified.
- The differential data between the P-VOL and the S-VOL will be stored in a pool volume as snapshot data. Therefore, you need at least one logical volume as a copy source (P-VOL), one V-VOL as a copy target (S-VOL), and one pool-VOL where you can store snapshot data.

Volume Pairs and Consistency Group

You can define plural XP Snapshot pairs as one consistency group by using RAID Manager. When you store snapshot data by consistency group, data is copied as of the same point in time for all P-VOLs in the group.

XP Snapshot Software

You can operate XP Snapshot by using the XP Remote Web Console computer. The Remote Web Console computer is connected to the storage systems via the TCP/IP local-area network (LAN). The Remote Web Console computer communicates and exchanges data directly with the service processor (SVP) of the connected systems. You can then acquire the information about the configuration or status of the system, or issue commands to the system.

License

You need to install the XP Business Copy license in the Remote Web Console computer before you operate XP Snapshot. In addition, to create XP Snapshot pairs, you must purchase the XP Business Copy license and ensure that there is enough licensed capacity for the pairs you are going to create.

XP Business Copy license capacity includes:

- XP Snapshot P-VOLs
- XP Snapshot pool-VOLs
- XP Business Copy P-VOLs
- XP Business Copy S-VOLs
- XP Business Copy reserved volumes

These volumes are called *used volumes*. When determining how much license capacity to purchase, ensure that there will be enough licensed capacity for these used volumes. You must limit the total capacity of the used volumes so that it will be equal to or less than the licensed capacity.

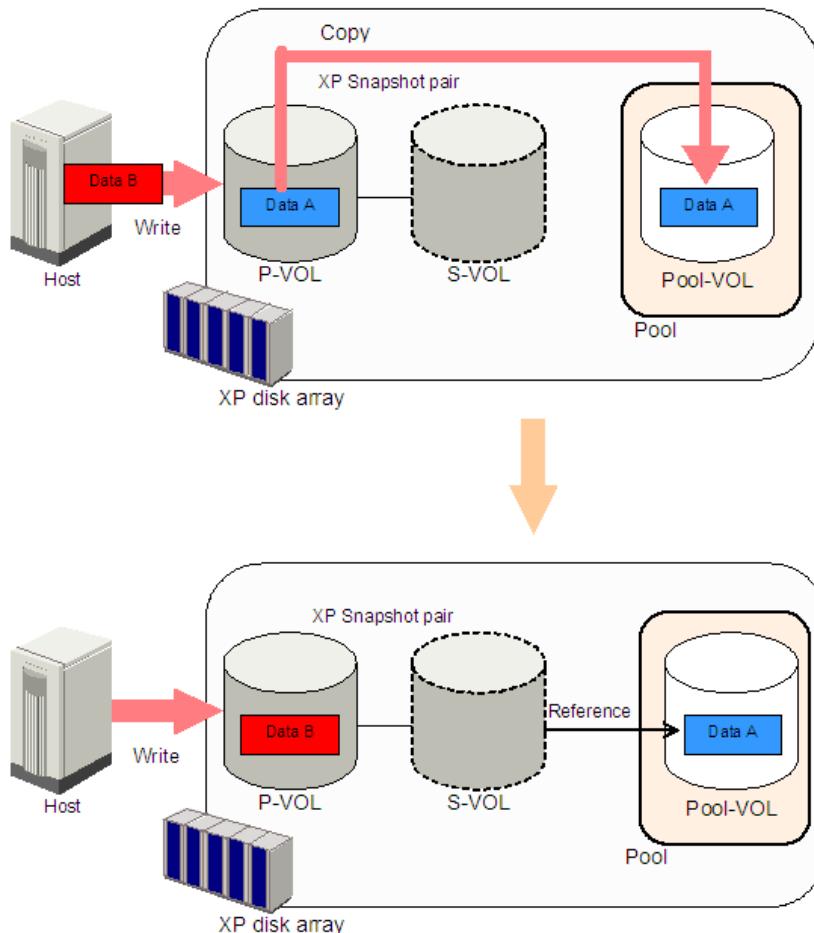
RAID Manager

Part of XP Snapshot operations require RAID Manager. When you use RAID Manager, you do not need to use the Remote Web Console computer. Instead, you operate XP Snapshot directly from the host by executing the commands.

XP Snapshot Operations

XP Snapshot enables you to maintain and copy data on the HP storage system. XP Snapshot is used for data for open systems such as UNIX and PC servers. ["How Data is Copied Using XP Snapshot" \(page 9\)](#) illustrates how data is copied in the XP24000/20000 Disk Array storage system using XP Snapshot.

Figure 2 How Data is Copied Using XP Snapshot



In [Figure 2 \(page 9\)](#), Data A is stored in some part of the P-VOL of an XP Snapshot pair. When the host requests an update of Data A to Data B, XP Snapshot will copy Data A to the pool volume in the pool before the P-VOL is updated. After the copy operation of Data A has completed, Data B will be written to the part where Data A was stored in P-VOL, and the P-VOL will be updated. From the V-VOL, you can access Data B in the P-VOL and Data A in the pool-VOL.

Create V-VOL Management Area Operation

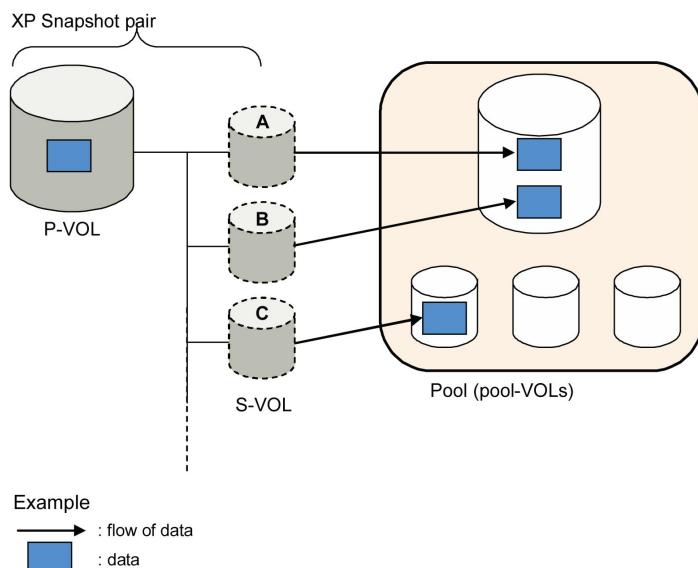
A V-VOL management area needs to be created in the shared memory before you use XP Snapshot. The V-VOL management area is an important area for associating an S-VOL (a V-VOL) of XP Snapshot with a pool-VOL. The V-VOL management area is created automatically when the additional shared memory is installed. Call HP technical support for the installation of additional shared memory.

There are two kinds of areas in the V-VOL management area: pool management block and pool association information. When you create pools or XP Snapshot pairs, the pool management block or pool association information will be stored in the V-VOL management area; therefore, the available capacity of the V-VOL management area decreases. When all capacity of the V-VOL management area is used, the capacity ratio of the pool management block and the pool association information in the V-VOL management area will be fixed. If the capacity of the pool management block is insufficient, problems may occur; for example, you cannot create new pools or create pools with a large amount of capacity. To solve such problems, you need to optimize the V-VOL management area.

Creation of a Pool

An XP Snapshot pool is an area to store snapshot data. A pool consists of multiple pool-VOLs, and snapshot data is stored in a pool-VOL. 1024 pool-VOLs can be registered in a pool, and 128 pools can be created in a storage system. [Figure 3 \(page 10\)](#) illustrates the relationship between an XP Snapshot pair and a pool.

Figure 3 The Relationship Between an XP Snapshot Pair and a Pool



You need to create a pool when you use XP Snapshot. Pool-VOLs registered in a pool can be added but cannot be deleted. In addition, all snapshot data in the pool must be deleted to delete the pool itself.

⚠ WARNING! The capacity of a pool is equal to the total capacity of the pool-VOLs registered in the pool. The status of the XP Snapshot pair will be PSUE (status when failure occurred) when the usage rate of the pool exceeds the capacity of the pool as a result of writing data in the volume of that pair. XP Snapshot data cannot be stored in the pool, and no new XP Snapshot pair can be created. Read “[Notes on Defining Pool Capacity](#)” (page 40), and ensure that there is sufficient pool capacity.

To create a pool, use the Pool window of the Remote Web Console.

Creation of a Virtual Volume

A V-VOL is a virtual volume which does not have physical memory space. A V-VOL needs to be created before you create an XP Snapshot pair, because you must use a V-VOL as the S-VOL of an XP Snapshot pair.

The definition of a V-VOL cannot be released if the V-VOL is being used as the S-VOL of an XP Snapshot pair. To release the definition, you must delete the XP Snapshot pair that uses the V-VOL.

⚠ CAUTION: If you are using HP-UX as a host server, remember the following when you execute the command on V-VOLs in order to recognize the device from the host server:

- If the device is already recognized by the host server, do not change its volumes to V-VOLs.
- Before executing the command to recognize the device, create XP Snapshot pairs and store snapshot data.

If you do not follow these precautions, an error may occur and the host server may be terminated. When the host server is terminated because of the command to recognize the device, retry the command by completing the following steps:

1. Force the command process and its parent process to terminate.
2. Create an XP Snapshot pair.
3. Store the snapshot data in the pool.
4. Execute the command again to recognize the device.

Servers (including RAID Manager) will indicate the emulation type of the V-VOLs with a 0 (for example, OPEN-0V). When you create an XP Snapshot pair, specify the volume whose emulation type includes 0, such as OPEN-0V, as the S-VOL.

Before creating a V-VOL, you need to define a V-VOL group. Like the emulation type of V-VOLs, the emulation type of a VDEV for a V-VOL group is OPEN-V. In addition, the capacity of the VDEV is always 4 TB. Therefore, the maximum capacity of a V-VOL is also 4 TB.

Creation of an XP Snapshot Pair

An XP Snapshot pair uses a V-VOL as its S-VOL. Therefore, you need to create a V-VOL before creating an XP Snapshot pair. In an XP Snapshot pair, up to 64 S-VOLs can be specified for a P-VOL.

- △ **CAUTION:** When you create an XP Snapshot pair, you decide which pool will be used by the pair. If you create two or more XP Snapshot pairs that share the same P-VOL, you need to specify the same pool for these pairs. For example, if you specify three S-VOLs for one P-VOL, you need to specify the same pool for these three pairs.

When you delete an XP Snapshot pair, the status of the volumes becomes SMPL(PD). You cannot create pairs by using SMPL(PD) volumes. If the volumes are in SMPL(PD) status, wait for a while and issue the command to create pairs after the volume status changes to SMPL.

Use the XP Business Copy's Pair Operation window to see the status of the volume. Using RAID Manager, you can check the volume status by the `pairdisplay` command, but you cannot distinguish between an SMPL volume and an SMPL(PD) volume. To distinguish between an SMPL volume and an SMPL(PD) volume by using RAID Manager, you need to issue the `inqraaid` command as well. The `inqraaid` command will show you whether or not the volume is being used by XP Snapshot. As a result of the `inqraaid` command, if the volume is not used by XP Snapshot, the volume status is SMPL. If the volume is used by XP Snapshot, the status of the volume is SMPL(PD).

NOTE: When using the `inqraaid` command specify the `-fw` option of the XP Snapshot pair IDs from 3 to 63.

Storing XP Snapshot Data

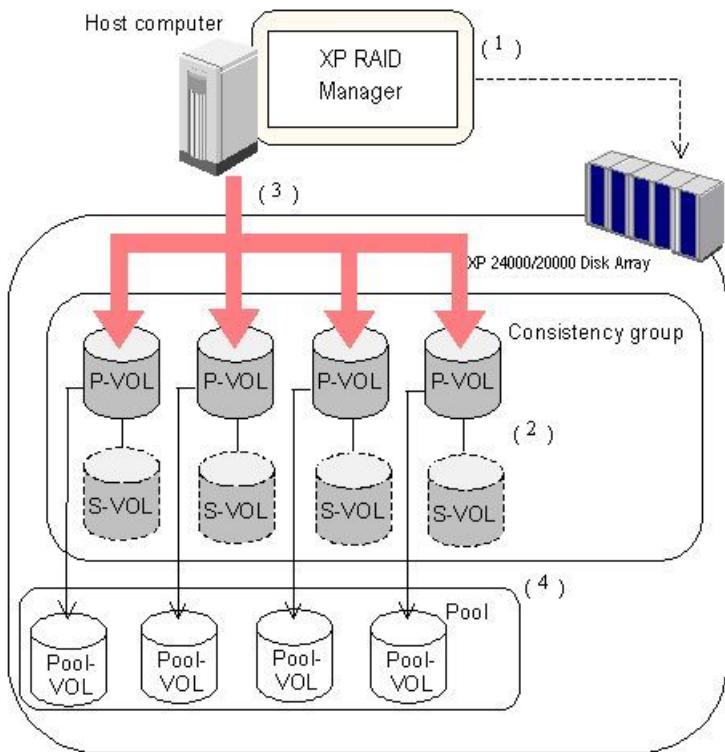
XP Snapshot data is a replica of data in the P-VOL of an XP Snapshot pair, and is stored in a pool. When the P-VOL is updated, the updated part of the data is copied to the pool as snapshot data before the P-VOL is updated. This process is called storing snapshot data.

If you issue a command to an XP Snapshot pair to store snapshot data, the snapshot data will be stored in the pool later, at the time a host makes a write request to the P-VOL of an XP Snapshot pair. An XP Snapshot pair can store up to 64 snapshot data per a P-VOL.

To store snapshot data, you can use the RAID Manager command.

You can also store snapshot data for each consistency group by using RAID Manager. When you store snapshot data by consistency group, data is copied as of the same point in time for all P-VOLs in the group. [Figure 4 \(page 13\)](#) shows an overview of storing snapshot data by a consistency group.

Figure 4 Overview of Storing XP Snapshot Data by a Consistency Group



When an XP24000/XP20000 Disk Array accepts the command from RAID Manager, which requests storing the data by a consistency group (1 in [Figure 4 \(page 13\)](#)), all status of the XP Snapshot pairs in the corresponding consistency group will change to PSUS (2 in [Figure 4 \(page 13\)](#)). After that, when the host issues write I/O request to each P-VOL in the corresponding consistency group (3 in [Figure 4 \(page 13\)](#)), snapshot data of corresponding volume is stored (4 in [Figure 4 \(page 13\)](#)).

You can also use the RAID Manager commands to store snapshot data by a consistency group. From XP Remote Web Console, you can only view the consistency groups.

XP Snapshot does not support Quick Split mode. Therefore, even if you specify Quick Split mode, Quick Split mode does not take effect.

Restoration of an XP Snapshot Pair

XP Snapshot can restore the contents of the P-VOL to the state when the snapshot data was stored in the pool by writing the snapshot data back to the P-VOL. Writing the snapshot data to the P-VOL is called restoration of the XP Snapshot pair.

If you restore the pair when the data is written in the S-VOL, instead of the snapshot data, the data in the S-VOL will be written back to the P-VOL.

If there are problems with the data of a P-VOL during a failure, you can restore the P-VOL to the normal state when the snapshot data was stored by executing restoration.

Deletion of XP Snapshot Data or an XP Snapshot Pair

The status of the XP Snapshot pair will be PSUE (status when the failure occurred) when, as a result of writing data in the volume of that pair, the capacity of snapshot data exceeds the capacity of the pool specified when the pool was defined. An XP Snapshot pair cannot be created and snapshot data cannot be stored in the pool. Therefore, unnecessary snapshot data needs to be deleted. There are two ways to delete snapshot data:

- Delete the XP Snapshot pair itself.
- Delete only the snapshot data.

When an XP Snapshot pair is deleted, not only is the snapshot data stored in the pool deleted, but also the relationship between the P-VOL and the S-VOL will be released. If only the snapshot data is deleted, the relationship between the P-VOL and the S-VOL is maintained. When only the snapshot data is deleted, the snapshot ID of the deleted snapshot data can be assigned to the newly stored snapshot data of the XP Snapshot pair.

After the command is issued to delete snapshot data, no more snapshot data of that XP Snapshot pair will be stored in the pool, even if the host tries to write data in the P-VOL. To store snapshot data for that XP Snapshot pair again, you need to issue the command for storing snapshot data.

The required time for deleting snapshot data or XP Snapshot pairs is several seconds, and sometimes more than ten minutes. The time will increase if the deleted pair uses a large amount of the pool, or if multiple pairs are deleted at one time.

When you delete an XP Snapshot pair, the status of the volumes becomes SMPL(PD). Use the XP Business Copy's Pair Operation window to see the status of the volume.

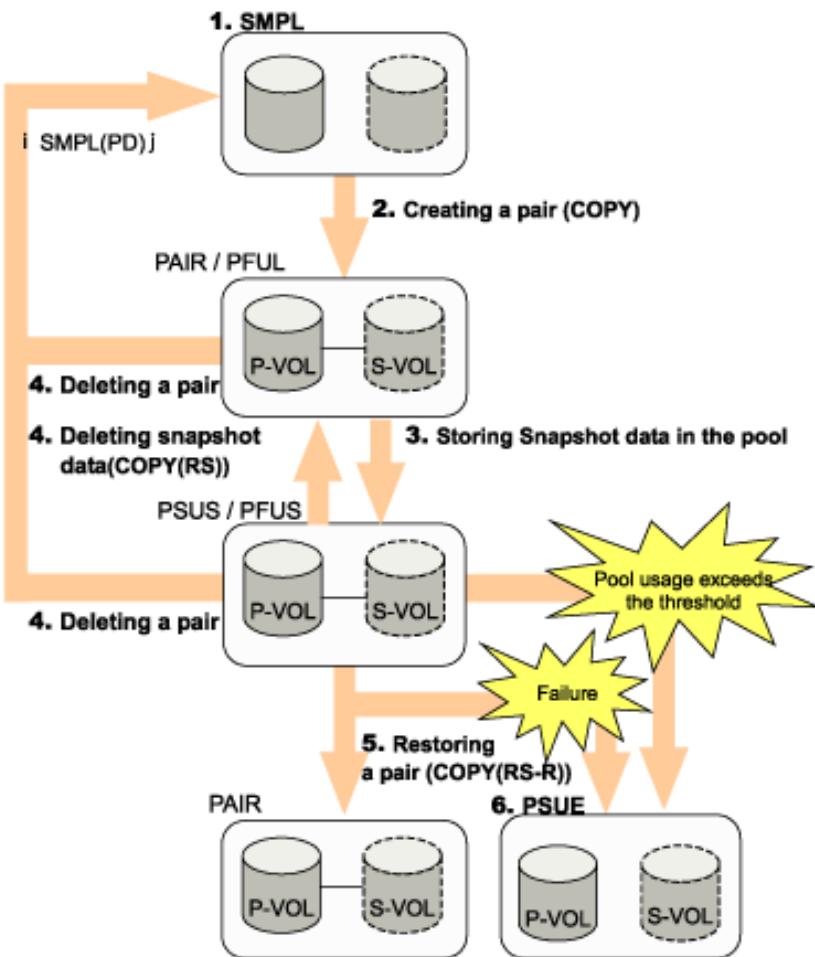
Using RAID Manager, you can check the volume status by the `pairdisplay` command, but you cannot distinguish between an SMPL volume and an SMPL(PD) volume. To distinguish between an SMPL volume and an SMPL(PD) volume by using RAID Manager, you need to issue the `inqraid` command as well. The `inqraid` command will show you whether or not the volume is being used by XP Snapshot. As a result of the `inqraid` command, if the volume is not used by XP Snapshot, the volume status is SMPL. If the volume is used by XP Snapshot, the status of the volume is SMPL(PD).

NOTE: When using the `inqraid` command, specify the `-fw` option of the XP Snapshot pair IDs from 3 to 63.

Status of the XP Snapshot Pairs

When you create or split an XP Snapshot pair, the status of the pair changes. “[XP Snapshot Pair Status Transition](#)” (page 15) shows the transition of the status of an XP Snapshot pair.

Figure 5 XP Snapshot Pair Status Transition



1. If a volume is not assigned to an XP Snapshot pair, its status is SMPL.
2. Issue the `paircreate` command on the SMPL volume to create an XP Snapshot pair. When you create the first pair for the P-VOL, the pair status changes to COPY, and then the pair status changes to PAIR when the operation completes. If you specify a volume which is already paired with one or more S-VOLs as the P-VOL to create another pair, the pair status will not change to COPY. The pair status will change to PAIR when the operation completes.
3. Issue the `pairsplit` command on the XP Snapshot pair in PAIR status to store the snapshot data in the pool. When the operation completes, the pair status changes to PSUS.
 - If you execute the `paircreate` command immediately after deleting the last snapshot data of the P-VOL, it may take time to create a new pair.
 - If the pool capacity exceeds the threshold when an XP Snapshot pair is in PAIR status, the pair status changes to PFUL in RAID Manager. For details, see the *HP StorageWorks XP RAID Manager User Guide*.
 - If the pool capacity exceeds the threshold when an XP Snapshot pair is in PSUS status, the pair status changes to PFUS in RAID Manager. For details, see the *HP StorageWorks XP RAID Manager User Guide*.
4. To delete only snapshot data and leave the XP Snapshot pair, issue the `pairresync` command to the PSUS or PFUS pair. During the operation, the pair status changes to COPY(RS). To delete the XP Snapshot pair, issue the `pairsplit-S` command or use Remote Web Console. During the operation, the pair status changes to SMPL(PD).
5. Issue the `pairresync -restore` command on the XP Snapshot pair in PSUS status to restore the pair. After that, the snapshot data will be written back to the P-VOL. During the operation,

the pair status changes to COPY(RS-R). When the operation completes, the pair status changes to PAIR.

6. A pool can contain only a predefined amount of data. If the total capacity of the snapshot data in the pool exceeds the pool capacity, the pair status changes to PSUE. The pair status also changes to PSUE when a failure occurs while restoring the pair or when the usage rate of the pool reaches 100 percent. The pair status may change to PSUE when the failure occurs during a process other than restoring.

Whether the host can read and write the P-VOL or S-VOL of an XP Snapshot pair depends on the status of the pair. [Table 2 \(page 16\)](#) shows the relationship between the pair status and the availability of the host access.

Table 2 Whether Hosts Can Access P-VOL and S-VOL

Pair Status	P-VOL		S-VOL	
	Read	Write	Read	Write
SMPL	Yes	Yes	—	—
COPY	Yes	Yes	No	No
PAIR/PFUL	Yes	Yes	No	No
PSUS/PFUS	Yes	Yes	Yes	Yes
SMPL(PD)	Yes	Yes	No	No
COPY(RS)	Yes	Yes	No	No
COPY(RS-R)	Yes	Yes	No	No
PSUE	Yes*	Yes*	No	No

Yes: Host can access the volume.

No: Host cannot access the volume.

*: If the pair status changes to PSUE because of a failure during restoration, the host cannot access that pair.



CAUTION: If the host computer uses application software to monitor the volumes of the XP Snapshot pairs, problems such as an abnormal end may occur. For example, because the S-VOL whose status is not PSUS (or PFUS) rejects the access from the host, problems may occur on the monitoring application software whose access is rejected. In addition, if the host computer connects to more than one port, problems may also occur on the ports that are not connected to the S-VOL that rejected the host access. You need to terminate the application software which monitors the volumes in order to solve these problems.

Use RAID Manager commands to operate XP Snapshot pairs. However, whether or not the operations complete normally depends on the status of the pairs. [Table 3 \(page 16\)](#) shows the pair statuses and the results of the RAID Manager commands.

Table 3 Pair Statuses and the Results of the RAID Manager Commands

Pair Status	RAID Manager Command						
	paircreate	paircreate -split	pairsplit	pairresync	pairresync -restore	pairsplit -S	pairsplit -E
SMPL	Yes	No	No	No	No	NOP	No
COPY	NOP	No	No	NOP	NOP	No	No
PAIR / PFUL	NOP	Yes	Yes	NOP	NOP	Yes	No

Table 3 Pair Statuses and the Results of the RAID Manager Commands (continued)

Pair Status	RAID Manager Command						
	paircreate	paircreate -split	pairsplit	pairresync	pairresync -restore	pairsplit -S	pairsplit -E
PSUS / PFUS	No	NOP	NOP	Yes	Yes	Yes	No
SMPL(PD)	No	No	No	No	No	NOP	No
COPY(RS)	NOP	No	No	NOP	NOP	No	No
COPY(RS-R)	NOP	No	No	NOP	NOP	No	No
PSUE	No	No	No	Yes*	No	Yes	NOP

Yes: The command executes the process and ends normally.

NOP: The command does not execute the process, but ends normally.

No: The command ends abnormally (that is, command rejected).

* If you issue the pairresync command to the pair whose status has changed to PSUE because of the shortage of the shared memory for the V-VOL management area, the command will be rejected and end abnormally.

When the command executes the process and ends normally, the pair status changes according to the process. For information about how the pair status changes when the command ends normally, see “XP Snapshot Pair Status Transition” (page 15) and the paragraphs under the figure.

- The hide mode (-m noread) on the S-VOL is not supported. If you specify the hide mode on the S-VOL and create a pair, the command will end normally, but the hide mode will be ignored.
- When the RAID Manager command ends abnormally (for example, when the RAID Manager command is rejected), and if the OS of the host computer is HP-UX, SSB (sense byte), which indicates the cause of the error, will be generated in the RAID Manager error log file. For more information about the SSBs and the cause of the errors, see “Troubleshooting When Using XP RAID Manager” (page 103).

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands

SSB	RAID Manager Command	Cause of Error
B901 B9A8 B9A9 B9AD	paircreate, pairresync, pairsplit	An error has occurred during the XP Snapshot pair operation. For the cause, check the SSB being output together.
9685	paircreate	Because there are no pair tables available, the XP Snapshot pair cannot be created.
9686	paircreate	Because of the shortage of the differential tables, XP Snapshot pair cannot be created.
9700	paircreate	Because the pool is not available, the XP Snapshot pair cannot be created.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
9702	paircreate	When attempting to create multiple XP Snapshot pairs by specifying multiple S-VOLs for one P-VOL, you specified a pool ID that was different from the one being used by existing pairs. As a result, new XP Snapshot pairs cannot be created.
9703	paircreate	Because the volume you specified as the P-VOL is being used by the other XP Snapshot S-VOL, the pair cannot be created.
9704	paircreate	Because the volume you specified as the S-VOL is being used by the other XP Snapshot P-VOL, the pair cannot be created.
9705	paircreate	Because the volume you specified as the S-VOL is being used by the other XP Snapshot S-VOL, the pair cannot be created.
9706	paircreate	Because the specified snapshot ID is being used by the other XP Snapshot pair, the new pair cannot be created.
9707	paircreate	Because the capacity of the pair exceeds the licensed capacity, the pair cannot be created.
9718	All commands	The command ended abnormally because a command other than the paircreate command was issued for the volume in the pair other than XP Snapshot pair. This error also may be reported when the command is executed with specifying an unsupported parameter.
9719	All commands	The command ended abnormally because the pair is in the status that the corresponding command is not accepted at present. This error also may be reported when the command is executed with specifying an unsupported parameter.
971a	paircreate	Because the capacity of shared memory is insufficient, the pair cannot be created.
971b	paircreate	Because the capacity of shared memory is insufficient, the pair cannot be created.
971f	pairresync -restore	Because the volume you specified as the P-VOL has an S-VOL Disable attribute, XP Snapshot pair cannot be restored.
9720	All commands	Any errors have occurred because of the XP Snapshot operation.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
9721	paircreate pairsplit pairresync pairresync -restore	Because either XP Snapshot or XP Business Copy is not installed, the command ends abnormally.
9723	All commands	Because no additional shared memory (FCV2, TPF, Extension is available, the command ends abnormally.
9724	All commands	Because no additional shared memory (more than XP Snapshot) is available, the command ends abnormally.
9725	All commands	Because the LDEV number of the volume you specified as the P-VOL is beyond the specified range, the command ends abnormally.
9726	All commands	Because you specified the unmounted volume as the XP Snapshot P-VOL, the command ends abnormally.
9727	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the blocked volume as the XP Snapshot P-VOL, the command ends abnormally.
9728	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the volume that is in process of formatting as the XP Snapshot P-VOL, the command ends abnormally.
9729	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the volume whose emulation type is other than OPEN-V as the XP Snapshot P-VOL, the command ends abnormally.
972a	paircreate	Because the volume you specified as the XP Snapshot P-VOL has the command device setting, the pair cannot be created.
972c	paircreate	Because the capacity of the volume you specified as the XP Snapshot P-VOL exceeds the supported size (4 TB), the pair cannot be created.
972e	paircreate	Because the capacity of the volume you specified as the XP Snapshot S-VOL exceeds the supported size (4 TB), the pair cannot be created.
972f	paircreate	Because you specified a V-VOL as the XP Snapshot P-VOL, the pair cannot be created.
9730	paircreate	Because you specified a pool-VOL as the XP Snapshot P-VOL, the pair cannot be created.
9731	pairresync -restore	When the XP Snapshot P-VOL and XP Continuous Access P-VOL share the volume, the status of the XP Continuous Access pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
9732	pairresync -restore	When the XP Snapshot P-VOL and XP Continuous Access Journal P-VOL share the volume, the status of the XP Continuous Access Journal pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.
9733	pairresync -restore	Because the XP Snapshot P-VOL and XP Continuous Access S-VOL share the volume, the XP Snapshot pair cannot be restored.
9734	pairresync -restore	Because the XP Snapshot P-VOL and XP Continuous Access Journal S-VOL share the volume, the XP Snapshot pair cannot be restored.
9735	paircreate	Because you specified an XP Continuous Access Journal's journal volume as the XP Snapshot P-VOL, the XP Snapshot pair cannot be created.
9736	paircreate, pairsplit, pairresync, pairresync -restore	Because the LUSE volumes you specified for the P-VOL and S-VOL do not have the same structure, the command ends abnormally.
973a	paircreate	Because you specified the volume with the VMA setting as the XP Snapshot P-VOL, the pair cannot be created.
973b	All commands	Because the LDEV number of the volume you specified as the S-VOL is beyond the specified range, the command ends abnormally.
973c	All commands	Because you specified the unmounted volume as the XP Snapshot S-VOL, the command ends abnormally.
973d	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the blocked volume as the XP Snapshot S-VOL, the command ends abnormally.
973e	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the volume that is in process of formatting as the XP Snapshot S-VOL, the command ends abnormally.
973f	paircreate, pairsplit, pairresync, pairresync -restore	Because you specified the volume whose emulation type is other than OPEN-V as the XP Snapshot S-VOL, the command ends abnormally.
9740	paircreate	Because the volume you specified as the XP Snapshot S-VOL has the command device setting, the pair cannot be created.
9742	paircreate	Because you specified an external volume as the XP Snapshot S-VOL, the pair cannot be created.
9745	paircreate	Because you specified a volume other than V-VOL as the XP Snapshot S-VOL, the pair cannot be created.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
9746	paircreate	Because you specified a pool-VOL as the XP Snapshot S-VOL, the pair cannot be created.
9747	paircreate	Because you specified the XP Continuous Access P-VOL as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
9748	paircreate	Because you specified the XP Continuous Access S-VOL as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
9749	paircreate	Because you specified the XP Continuous Access Journal data volume or journal volume in the intermediate site of 3DC cascading configuration as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
974a	paircreate	Because you specified the XP Continuous Access Journal P-VOL as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
974b	paircreate	Because you specified the XP Continuous Access Journal S-VOL as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
974c	paircreate	Because you specified the XP Continuous Access Journal journal volume as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
974f	All commands	Because the volume you specified as the S-VOL has an S-VOL Disable attribute, the command ends abnormally.
9750	paircreate	Because you specified the volume with the VMA setting as the XP Snapshot S-VOL, the pair cannot be created.
9752	paircreate, pairsplit, pairresync, pairresync -restore	Because the Max LBA size of the volumes you specified as the XP Snapshot P-VOL and S-VOL are different, the command ends abnormally.
9753	paircreate, pairsplit, pairresync, pairresync -restore	Because the number of slots of the volumes you specified as the XP Snapshot P-VOL and S-VOL are different, the command ends abnormally.
9754	paircreate	Because you specified the XP Thin Provisioning V-VOL as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
9756	All commands	Because you specified the XP Business Copy reserved volume as the XP Snapshot P-VOL, the command ends abnormally.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
9757	All commands	Because you specified the XP Auto LUN source volume as the XP Snapshot P-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
9758	All commands	Because you specified the XP Auto LUN target volume as the XP Snapshot P-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
9759	All commands	Because you specified the XP Auto LUN reserved volume as the XP Snapshot P-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
975a	All commands	Because you specified the XP Business Copy P-VOL as the XP Snapshot S-VOL, the command ends abnormally.
975b	All commands	Because you specified the XP Business Copy S-VOL as the XP Snapshot S-VOL, the command ends abnormally.
975c	All commands	Because you specified the XP Business Copy reserved volume as the XP Snapshot S-VOL, the command ends abnormally.
975d	All commands	Because you specified the XP Auto LUN source volume as the XP Snapshot S-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
975e	All commands	Because you specified the XP Auto LUN target volume as the XP Snapshot S-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
975f	All commands	Because you specified the XP Auto LUN reserved volume as the XP Snapshot S-VOL, the command ends abnormally. For information on using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
976a	paircreate	Unavailable parameter (unsupported parameter) is specified in the command.
976c	pairsplit	Because the command was executed with the PSUE option, the XP Snapshot data cannot be stored.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
976e	pairresync	When XP Snapshot P-VOL and XP Continuous Access S-VOL share the volume, the status of the XP Continuous Access pair is COPY. Therefore, the snapshot data cannot be stored.
976e	pairsplit	When the XP Snapshot P-VOL and XP Continuous Access S-VOL share the volume, the status of the XP Continuous Access pair is COPY. Therefore, the snapshot data cannot be stored.
976f	pairsplit	When the XP Snapshot P-VOL and XP Continuous Access Journal S-VOL share the volume, the status of the XP Continuous Access Journal pair is COPY. Therefore, the snapshot data cannot be stored.
9771	paircreate	Because you specified XP Continuous Access Journal delta resync pair volume as the XP Snapshot P-VOL, the XP Snapshot pair cannot be created.
9772	paircreate	Because you specified the XP Continuous Access Journal delta resync pair volume as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
9774	paircreate	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the MU number you specified for the XP Snapshot pair is already used by the XP Business Copy pair. Therefore, the XP Snapshot pair cannot be created.
9776	paircreate	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the XP Business Copy P-VOL you specified for the XP Snapshot P-VOL has consistency group settings. Therefore, the XP Snapshot pair cannot be created.
9777	paircreate	When the XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, you specified the MU number zero (0) for the XP Snapshot P-VOL. Therefore, the XP Snapshot pair cannot be created.
9778	paircreate	When the XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, the XP Business Copy S-VOL you specified for the XP Snapshot P-VOL has consistency group settings. Therefore, the XP Snapshot pair cannot be created.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
977a	paircreate, pairsplit	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the XP Business Copy pair was in the process of resynchronization. Therefore, the command ends abnormally.
977b	paircreate, pairsplit	When the XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, the status of the XP Business Copy pair is other than PSUS. Therefore, the command ends abnormally.
977c	pairresync -restore	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the status of the XP Business Copy pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.
977d	pairresync -restore	When the XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, the status of the XP Business Copy pair is other than PSUS. Therefore, the XP Snapshot pair cannot be restored.
977e	pairsplit	Since the pool or the pool-VOL is blocked, the XP Snapshot data cannot be stored.
9783	pairresync -restore	The XP Snapshot pair cannot be restored for any of the following reasons: <ul style="list-style-type: none">• The snapshot data of the XP Snapshot pair for restoration is being stored per consistency group.• The P-VOL of the XP Snapshot pair for restoration is used as the P-VOL of another XP Snapshot pair, and the snapshot data of the latter XP Snapshot pair is being stored per consistency group.
9786	paircreate, pairsplit, pairresync, pairresync -restore	Since quorum disks are specified as P-VOLs of XP Snapshot pairs, the command ends abnormally.
9787	paircreate, pairsplit, pairresync, pairresync -restore	Since quorum disks are specified as S-VOLs of XP Snapshot pairs, the command ends abnormally.

Table 4 SSBs and Causes of Error Issued Upon Rejection of RAID Manager Commands (continued)

SSB	RAID Manager Command	Cause of Error
978a	paircreate	Because one of the following cases happened, the XP Snapshot pair cannot be created by specifying the consistency number. <ul style="list-style-type: none">• The specified consistency group number is in use for XP Business Copy Software.• The number of pairs has already exceeded the maximum number of pairs that can be created for one consistency group.• The pair which uses the same P\ VOL exists already in the specified consistency group.
978b	paircreate	The XP Snapshot pair cannot be created because the specified consistency group number is out of the range of the number which can be specified.
978c	pairsplit	The snapshot data cannot be stored because the XP Continuous Access Asynchronous Software pair status is other than PSUS or PSUE when XP Snapshot (P\ VOL) and XP Continuous Access Asynchronous Software (S\ VOL) share the volume.
978e	paircreate	The XP Snapshot pair for which the consistency group is specified cannot be created because the P\ VOL or S\ VOL of the XP Continuous Access Asynchronous Software pair is specified as the P\ VOL of the XP Snapshot pair.
9790	paircreate	The XP Thin Provisioning virtual volume that is undergoing capacity expansion is specified as the XP Snapshot P\ VOL. Therefore, the XP Snapshot pair cannot be created.
9793	paircreate	The XP Snapshot pair cannot be created because the XP Thin Provisioning Software V\ VOL that is discarding zero data is specified as a P\ VOL of the XP Snapshot pair.
B9A7	All commands	The consistency group information cannot be obtained because the XP Snapshot is not installed.

Copy Threshold Option

If the load of the storage system increases, host server I/O performance (response) may be degraded. If XP Snapshot performs the restore operation when the load of the storage system is heavy, it is more likely that host server I/O performance (response) may be degraded. The Copy Threshold option temporarily stops copy processing caused by the restore operation when the load of the storage system is heavy. If you set this option in effect, you can minimize the degradation of host I/O performance by temporarily stopping copy processing caused by the restore operation when the load of the storage system is heavy.

The Copy Threshold option is effective only when the load of the storage system is heavy. When the Copy Threshold option is in effect, all the copy processing by the restore operation stops. For information about the setting of the Copy Threshold option, call HP technical support.

Copy operations that are stopped by the Copy Threshold option will resume when the load of the storage system becomes light. If this option is in effect, not only XP Snapshot copy operations, but also the copy operations of the following program products, will stop when the load of the storage system is heavy:

- XP Business Copy Software
- XP Business Copy for Mainframe
- HP StorageWorks XP for FlashCopy Mirroring Software (both Version 1 and 2)
- XP Auto LUN Software

Interoperability with Other Products and Functions

XP Snapshot can create pairs by sharing volumes with other program products, such as XP Business Copy or XP Continuous Access. In addition, you can create XP Snapshot pairs by using volumes to which attributes are assigned by the Data Retention Utility or RAID Manager. [Table 5 \(page 26\)](#) shows whether or not XP Snapshot pairs can share volumes with other program products.

Table 5 Volume Sharing with Other Program Products

Volumes of Other Program Products	XP Snapshot Pair P-VOL	XP Snapshot Pair S-VOL
XP Business Copy pair P-VOL	Yes ¹	No
XP Business Copy pair S-VOL	Yes ²	No
XP Continuous Access pair P-VOL	Yes	No
XP Continuous Access pair S-VOL	Yes	No
HP StorageWorks XP XP Continuous Access Journal Software pair P-VOL	Yes	No
XP Continuous Access Journal pair S-VOL	Yes	No
Auto LUN source volume ²	Yes	No
Auto LUN target volume ²	No	No
<i>Read Only</i> volume	Yes	Yes
<i>Protect</i> volume	Yes	Yes
S-VOL Disable volume	Yes	Yes
Zero Read Capacity volume	Yes	Yes
<i>Invisible</i> volume	Yes	Yes

Yes: The XP Snapshot volume can be shared.

No: The XP Snapshot volume cannot be shared.

1 An XP Business Copy pair and an XP Snapshot pair cannot have the same mirror unit (MU) number. For example, if the MU number of the XP Business Copy pair is 0, you cannot create an XP Snapshot pair whose MU number is 0 and whose P-VOL is also used as an XP Business Copy P-VOL. Also, if the MU number of the XP Snapshot pair is 1, you cannot create an XP Business Copy pair whose MU number is 1 and whose P-VOL is also used as an XP Snapshot P-VOL.

2 For information on using XP Auto LUN Software, contact HP technical support (see ["Contacting HP" \(page 116\)](#)).

When XP Snapshot shares volumes with the other program products, some operations are restricted according to the pair statuses. For detailed information, see the following sections.

- You need Data Retention Utility to set the *Read Only* attribute, the *Protect* attribute, or S-VOL Disable. For details, see the *HP StorageWorks XP24000/XP20000 Data Retention Utility User Guide*.
- You need RAID Manager to set the *Zero Read Capacity* attribute or the *Invisible* attribute. For details, see the *HP StorageWorks XP RAID Manager User Guide*.
- You can check if the volume has the *Read Only* attribute, the *Protect* attribute, S-VOL Disable, the *Zero Read Capacity* attribute, or the *Invisible* attribute by checking the Data Retention Utility window. For details, see the *HP StorageWorks XP24000/XP20000 Data Retention Utility User Guide*.

Data Retention Utility

Data Retention Utility can set four different kinds of access attributes on the volumes: Read/Write, Read Only, Protect, and S-VOL Disable. XP Snapshot cannot create a pair by specifying a volume whose access attribute is S-VOL Disable as the S-VOL. In addition, if the S-VOL Disable attribute is set on the P-VOL of the XP Snapshot pair, you cannot restore the pair.

By using Data Retention Utility, you can set the Read/Write, Read Only, Protect, or S-VOL Disable attribute on the volumes that are already used by the XP Snapshot pairs. However, when the pair is in the following status, you cannot set the S-VOL Disable attribute on the pair volumes:

- COPY*
- SMPL(PD)*
- COPY(RS)*
- COPY(RS-R)
- PSUE*

*: You can set S-VOL Disable on the P-VOL even if the pair status is COPY, SMPL(PD), COPY(RS), or PSUE.

For detailed information about setting the access attribute, see the *HP StorageWorks XP24000/XP20000 Data Retention Utility User Guide*.

Auto LUN

Regardless of the status of the migration plans of Auto LUN, you cannot perform any XP Snapshot operations on a volume that is used by the migration plan. To use an XP Snapshot P-VOL as the source volume for the migration plan, you need to create the XP Snapshot pair first, and then create the migration plan.

When the XP Snapshot P-VOL and the source volume for the migration plan are shared, you can execute the migration plan only when the XP Snapshot pair is in PAIR status. Deleting and canceling the migration plan are always allowed. These operations are not affected by the XP Snapshot pair status.

For information on using XP Auto LUN, contact HP technical support (see “[Contacting HP](#)” ([page 116](#))).

XP Business Copy

“[XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Business Copy P-VOL](#)” ([page 28](#)) and “[XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Business Copy S-VOL](#)” ([page 28](#)) show the relationship between XP Business Copy pair status and XP Snapshot operations when the XP Snapshot P-VOL is shared with an XP Business Copy volume.

“[XP Business Copy Operations for Shared XP Snapshot P-VOL/XP Business Copy P-VOL](#)” ([page 29](#)) and “[XP Business Copy Operations for Shared XP Snapshot P-VOL/XP Business Copy S-VOL](#)”

(page 29) show the relationship between the XP Snapshot pair status and XP Business Copy operations for shared volumes.

For detailed information about XP Business Copy pair status and operations, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

- Because the XP Snapshot S-VOL uses the data in the P-VOL, XP Business Copy's quick backward pairresync operation (Quick Restore) is not allowed.
- If a volume of an XP Business Copy pair has consistency group settings, you cannot use this volume to create an XP Snapshot pair. Also, if you use a volume of an XP Snapshot pair to create the XP Business Copy pair, you cannot set the consistency group to the XP Business Copy pair.
- If a volume of an XP Snapshot pair has consistency group settings, you cannot use this volume to create an XP Business Copy Software pair. Also, if you use a volume of an XP Business Copy pair to create the XP Snapshot pair, you cannot set the consistency group to the XP Snapshot pair.

Table 6 XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Business Copy P-VOL

XP Snapshot Operations	XP Business Copy Pair Status							
	COPY	PAIR	COPY (SP)	PSUS (SP)	PSUS	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Storing snapshot data (pairsplit)	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Restoring pairs (pairresync -restore)	No	No	No	No	Yes	No	No	Yes
Deleting snapshot data (pairresync)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

Table 7 XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Business Copy S-VOL

XP Snapshot Operations	XP Business Copy Pair Status							
	COPY	PAIR	COPY (SP)	PSUS (SP)	PSUS	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	No	No	No	No	Yes	No	No	No
Storing snapshot data (pairsplit)	N/A	No	No	No	Yes	No	No	No
Restoring pairs (pairresync -restore)	N/A	No	No	No	Yes	No	No	No
Deleting snapshot data (pairresync)	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deleting pairs (pairsplit -S)	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

N/A: Not applicable.

Table 8 XP Business Copy Operations for Shared XP Snapshot P-VOL/XP Business Copy P-VOL

XP Business Copy Operations	XP Snapshot Pair Status						
	COPY	PAIR	PSUS	SMPL (PD)	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	Yes	Yes	Yes	Yes	Yes	No	Yes
Creating and splitting pairs (paircreate -split)	Yes	Yes	Yes	Yes	Yes	No	Yes
Splitting pairs (pairsplit)	Yes	Yes	Yes	Yes	Yes	No	Yes
Forward pair resynchronization (pairresync)	Yes	Yes	Yes	Yes	Yes	No	Yes
Normal backward pair resynchronization (pairresync -restore)	Yes	Yes	Yes	Yes	Yes	No	Yes
Quick backward pair resynchronization (pairresync -restore)	No	No	No	No	No	No	No
Suspending pairs (pairsplit -E)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

Table 9 XP Business Copy Operations for Shared XP Snapshot P-VOL/XP Business Copy S-VOL

XP Business Copy Operations	XP Snapshot Pair Status						
	COPY	PAIR	PSUS	SMPL (PD)	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	No	No	No	No	No	No	No
Creating and splitting pairs (paircreate -split)	No	No	No	No	No	No	No
Splitting pairs (pairsplit)	Yes	Yes	Yes	Yes	Yes	No	Yes
Forward pair resynchronization (pairresync)	Yes	Yes	Yes	Yes	Yes	No	Yes
Normal backward pair resynchronization (pairresync -restore)	Yes	Yes	Yes	Yes	Yes	No	Yes
Quick backward pair resynchronization (pairresync -restore)	No	No	No	No	No	No	No
Suspending pairs (pairsplit -E)	Yes	Yes	Yes	Yes	Yes	No	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

XP Continuous Access or XP Continuous Access Journal

"XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal P-VOL" (page 30) and "XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL" (page 30) show the relationship between the XP Continuous Access or XP Continuous Access Journal pair status and XP Snapshot operations when the XP Snapshot P-VOL is shared with an XP Continuous Access or XP Continuous Access Journal volume.

"XP Continuous Access / XP Continuous Access Journal Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal P-VOL" (page 31) and "XP Continuous Access/XP Continuous Access Journal Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL" (page 31) show the relationship between the XP Snapshot pair status and XP Continuous Access or XP Continuous Access Journal operations for shared volumes.

If a volume uses two mirrors in the 3DC multi-target configuration, the 3DC cascade configuration, or the delta resync configuration consisting of three XP Continuous Access Journal sites, the volume cannot be used as an XP Snapshot pair volume.

For detailed information about XP Continuous Access pair status and operations, see the *HP StorageWorks XP24000/XP20000 Continuous Access Software User Guide*. For detailed information about XP Continuous Access Journal pair status and operations, see the *HP StorageWorks XP24000/XP20000 XP Continuous Access Journal Software User Guide*.

Table 10 XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal P-VOL

XP Snapshot Operations	XP Continuous Access / XP Continuous Access Journal Pair Status					
	COPY	PAIR	PSUS	PSUE	Suspending	Deleting
Creating pairs (paircreate)	Yes	Yes	Yes	Yes	Yes	Yes
Storing snapshot data (pairsplit)	Yes [*]	Yes [*]	Yes [*]	Yes [*]	Yes [*]	Yes [*]
Restoring pairs (pairresync -restore)	No	No	Yes	Yes	No	No
Deleting snapshot data (pairresync)	Yes	Yes	Yes	Yes	Yes	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

* These pairs cannot be used as XP Continuous Access Journal delta resync pair volumes.

Table 11 XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL

XP Snapshot Operations	XP Continuous Access / XP Continuous Access Journal Pair Status						
	COPY	PAIR	PSUS	PSUE	SSWS ¹	Suspending	Deleting
Creating pairs (paircreate)	Yes ³	Yes ³	Yes ³	Yes ³	Yes ³	Yes ³	Yes ³
Storing snapshot data (pairsplit)	No	Yes	Yes	Yes	Yes	Yes	Yes
Restoring pairs (pairresync -restore) ²	No	No	No	No	No	No	No

Table 11 XP Snapshot Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL (continued)

XP Snapshot Operations	XP Continuous Access / XP Continuous Access Journal Pair Status						
	COPY	PAIR	PSUS	PSUE	SSWS ¹	Suspending	Deleting
Deleting snapshot data (pairresync)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

1: SSWS is a status of XP Continuous Access Journal pairs. XP Continuous Access pairs will not change to SSWS status.

2: When you restore the XP Snapshot pair whose P-VOL is used as an XP Continuous Access or XP Continuous Access Journal S-VOL, you need to switch operations from the local site to the remote site by executing the horctakeover command.

3: These pairs cannot be used as XP Continuous Access Journal delta resync pair volumes

Table 12 XP Continuous Access / XP Continuous Access Journal Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal P-VOL

XP Continuous Access / XP Continuous Access Journal Operations	XP Snapshot Pair Status						
	COPY	PAIR	PSUS	SMPL (PD)	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	Yes	Yes	Yes	Yes	Yes	No	Yes
Splitting pairs (pairsplit)	Yes	Yes	Yes	Yes	Yes	-	Yes
Resynchronizing pairs (pairresync)	Yes	Yes	Yes	Yes	Yes	No	Yes
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switching to remote site (horctakeover)	Yes	Yes	Yes	Yes	Yes	No	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected)

N/A: Not Applicable

Table 13 XP Continuous Access/XP Continuous Access Journal Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL

XP Continuous Access / XP Continuous Access Journal Operations	XP Snapshot Pair Status						
	COPY	PAIR	PSUS	SMPL (PD)	COPY (RS)	COPY (RS-R)	PSUE
Creating pairs (paircreate)	No	No	No	Yes	No	No	No
Splitting pairs (pairsplit)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Resynchronizing pairs (pairresync)	Yes	Yes	Yes	Yes	Yes	No	Yes

Table 13 XP Continuous Access/XP Continuous Access Journal Operations for Shared XP Snapshot P-VOL/XP Continuous Access or XP Continuous Access Journal S-VOL (continued)

XP Continuous Access / XP Continuous Access Journal Operations	XP Snapshot Pair Status						
	COPY	PAIR	PSUS	SMPL (PD)	COPY (RS)	COPY (RS-R)	PSUE
Deleting pairs (pairsplit -S)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switching to remote site (horctakeover)	Yes	Yes	Yes	Yes	Yes	No	Yes

Yes: Operation is allowed.

No: Operation is not allowed (command rejected).

HP StorageWorks XP Thin Provisioning Software

If you are to use both XP Snapshot and XP Thin Provisioning in one storage system, note the following:

- You cannot use pools for XP Thin Provisioning as pools for XP Snapshot, and vice versa.
- If you create pools for XP Thin Provisioning, the number of the available pools for XP Snapshot decreases according to the number of XP Thin Provisioning pools.
- When an XP Thin Provisioning virtual volume is specified as the XP Snapshot P-VOL, you will need to recreate the corresponding XP Snapshot virtual volume if you expand the size of the XP Thin Provisioning volume.

3 Preparing for XP Snapshot Operations

This chapter describes the requirements for using XP Snapshot, the installation procedure for XP Snapshot, and calculation of the number of pairs that XP Snapshot can create. Read this chapter before you start the operation of XP Snapshot.

- “System Requirements” (page 33)
- “Operational Requirements” (page 35)
- “Requirements for Maintaining XP Snapshot” (page 41)
- “Installing and Uninstalling XP Snapshot” (page 42)
- “Starting XP Snapshot” (page 42)

System Requirements

XP Snapshot operations involve the storage system containing the primary and secondary volumes and the licensed XP Snapshot and XP Business Copy feature enabled on Remote Web Console. The system requirements for XP Snapshot are as follows.

Volume Requirements

XP Snapshot uses P-VOLs, S-VOLs, and pool-VOLs. The requirements (such as emulation type or path definition) for the volumes used for XP Snapshot are described in this section.

XP Snapshot supports RAID1, RAID5, and RAID6.

Table 14 P-VOL Requirements

Item	Requirement
Volume type	Logical volume (LDEV) LUSE volume can be specified. NOTE: A LUSE P-VOL must be paired with an S-VOL of the same size and the same structure. For example, if a LUSE P-VOL is created by combining volumes of 1 GB, 2 GB and 3 GB in this order, you must specify a LUSE volume which has exactly the same size and the same combination order as the S-VOL. You cannot specify the following volumes as XP Snapshot P-VOLs. <ul style="list-style-type: none">• Volumes used as pool-VOLs• Volumes used as S-VOLs of XP Snapshot pairs
Emulation type	OPEN-V
Maximum number	16,384
Path definition	Required
Maximum capacity	4 TB

Table 15 S-VOL Requirements

Item	Requirement
Volume type	V-VOL You cannot specify the following volumes as XP Snapshot S-VOLs. <ul style="list-style-type: none">• Volumes used as S-VOLs of XP Snapshot pairs• Volumes used by a pair or migration plan of another program product NOTE: A LUSE S-VOL must be paired with a P-VOL of the same size and the same structure.
Emulation type	OPEN-V
Maximum number	16,384
Path definition	Required

Table 16 Pool-VOL Requirements

Item	Requirement
Volume type	Logical volume (LDEV) NOTE: Separating normal volumes and pool-VOLs into different parity groups is recommended for the best performance. You cannot specify the following volumes as XP Snapshot pool-VOLs: <ul style="list-style-type: none">• Volumes whose LDEV status is other than Normal and Normal (Quick Format) You cannot specify volumes in blocked status or in copying process.• LUSE volumes• Volumes used as P-VOLs or S-VOLs of XP Snapshot pairs• Volumes already registered in pools of XP Snapshot or XP Thin Provisioning• Volumes used by a pair or migration plan of another program product• Volumes that are set with the Protect or Read Only attribute, or the S-VOL Disable setting by Data Retention Utility• Volumes that have Cache Residency Manager settings• System disks• Command devices• Quorum disks You cannot mix the following pool-VOLs in a pool: <ul style="list-style-type: none">• Internal volumes and external volumes• External cache enabled and external cache disabled volumes
Emulation type	OPEN-V
RAID level	All RAID levels are supported. You may register pool-VOLs whose RAID levels are different in the same pool; however, HP recommends that you specify the same RAID level for pool-VOLs registered in the same pool so that performance is not decreased.
Encryption status	Volumes of any encryption status (Enable, Disable, and hyphen) can be used for pool-VOL.
Drive type	FC, SATA, and SSD can be used as drive types. When internal volumes are used, pool-VOLs with different drive types cannot be intermixed in the same pool. When external volumes are used, pool-VOLs with different drive types can be intermixed in the same pool. For best performance, the use of volumes with different drive types in a pool is not recommended.

Table 16 Pool-VOL Requirements (continued)

Item	Requirement
Maximum number	8,192 However, the maximum number of pool-VOLs that can be registered in each pool is 1024. That is, you can create up to 128 pools in one storage system. In addition, the volume already registered as a pool-VOL in a pool cannot be registered in another pool. Also note that if you create pools for XP Thin Provisioning, the number of available pools for XP Snapshot will decrease according to the number of XP Thin Provisioning pools.
Volume capacity	8 GB to 4 TB. NOTE: Dividing a parity group into at least 16 is recommended for the best performance.
Path definition	Not required. The volumes with path definition cannot be specified as a pool-VOL

XP Snapshot Software Requirements

To use XP Snapshot, all storage system hardware, microcode, and software required for XP Business Copy operations must be installed and enabled. You also need to purchase the license key for XP Business Copy and install it in Remote Web Console. For detailed information about the license key and software installation, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

Note that you must operate the Remote Web Console in modify mode to perform XP Snapshot operations. Users in view mode can view XP Snapshot information, but they cannot create new pairs or change the pair status. For information about how to set up and use the Remote Web Console computer, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

License Requirements

Capacity used by XP Snapshot will be subtracted from the licensed capacity for XP Business Copy. Therefore, you need to ensure that the licensed capacity for XP Business Copy is larger than the capacity to be used by both XP Business Copy and XP Snapshot.

Even when a volume is used for multiple purposes, only the capacity of this volume itself is added to the total volume capacity; there is no need to multiply the capacity of this volume by the number of purposes it is used for. For example, even if you share one volume as XP Snapshot P-VOL and XP Business Copy P-VOL, only the capacity of the volume itself is added to the total volume capacity and there is no need for it to be doubled.

Shared Memory Requirements

The shared memory for the differential table and the V-VOL management area must be installed on the base board. Note that you cannot share the memory for the V-VOL management area with the memory of XP Thin Provisioning.

Requirements for RAID Manager

To use RAID Manager for XP Snapshot operations, you need to have one volume for RAID Manager's command device. For details about how to set the command device, see the *HP StorageWorks XP RAID Manager User Guide*.

Operational Requirements

This section explains the information you need to know when you perform XP Snapshot operations.

Calculating the Maximum Number of Pairs

The number of XP Snapshot pairs that can be created for a storage system depends on the number of differential tables, the capacity of shared memory for the V-VOL management area, or the number of pair tables. Calculate the number of XP Snapshot pairs that can be created, first by using the number of differential tables, then by using the capacity of shared memory for the V-VOL management area, and finally by using the number of pair tables. Compare the three calculation results. The smallest value is the maximum number of XP Snapshot pairs that can be created for the storage system.

The following are the descriptions of the calculation of the number of XP Snapshot pairs that can be created based on the number of differential tables, the capacity of shared memory for the V-VOL management area, or the number of pair tables.

Calculating the Number of XP Snapshot Pairs by Using the Number of Differential Tables

If additional shared memory is installed, the maximum number of differential tables will be 26,176 or 57,600 or 104,768 or 146,688 or 209,600. To calculate the number of XP Snapshot pairs that can be created, calculate the number of differential tables required for the XP Snapshot pair and compare it with the number of differential tables of the whole storage system. Other than XP Snapshot, the following program products use differential tables in the storage system:

- XP Business Copy
- ShadowImage for Mainframe
- Compatible FlashCopy Version 1
- Compatible FlashCopy Version 2
- XP Auto LUN

If any of the mentioned program products other than XP Snapshot are used in the same storage system, the number of differential tables that can be used by XP Snapshot pairs is calculated by subtracting the number of differential tables used by the pairs (migration plan for XP Auto LUN) of the previously mentioned program products from the number of differential tables of the whole storage system.

See the manual of each program product for the calculation of the number of required differential tables for XP Business Copy, XP Business Copy for Mainframe, Compatible FlashCopy Version 1, Compatible FlashCopy Version 2, and XP Auto LUN.

For information on using XP Auto LUN, contact HP technical support (see “[Contacting HP](#)” ([page 116](#))).

To calculate the number of differential tables for each XP Snapshot pair, use the following formula:

$$(X \div 256) \div (Z)$$

(X): Capacity of the volume (in kilobytes)

(Z): The number of slots that a differential table can manage (639×32)

You must round up the result of the calculation to the nearest whole number.

When the capacity of the volume (X in the formula) is 16 GB (16,777,216 kB), the number of differential tables for each XP Snapshot pair can be calculated as follows.

Example

$$(16,777,216 \div 256) \div (639 \times 32) = 3.19523$$

3.19523 will be 4 when the value after the decimal point is rounded up. This indicates that four differential tables are required to create an XP Snapshot pair.

Assume that no other program products use differential tables in a storage system where the number of differential tables is 26,176. The number of differential tables that XP Snapshot can use is 26,176. To create XP Snapshot pairs that require four differential tables for each pair, the calculation will be as follows.

$$26,176 \div 4 = 6,544$$

Thus, the maximum number of XP Snapshot pairs that can be created is 6,544.

Calculating the Number of XP Snapshot Pairs by Using the Shared Memory Capacity for the Virtual Volume Management Area

The V-VOL management area consists of the following three elements:

- Pool association information
- Pool management block
- Management information other than those above (shared memory is fixed to 10 MB)

The shared memory of the V-VOL management area differs according to the additional shared memory. [Table 17 \(page 37\)](#) shows the detailed information.

Table 17 Additional Shared Memory for the V-VOL Management Area

Shared Memory	Shared Memory Capacity
XP Snapshot 1	751,619,276 bytes
XP Snapshot 2	1,073,741,823 bytes
XP Snapshot 3	2,147,483,647 bytes
XP Snapshot 4	3,221,159,935 bytes
XP Snapshot 5	4,294,901,759 bytes

To calculate the maximum number of XP Snapshot pairs that can be created for a subsystem, use the following formula:

$$\text{Maximum number of XP Snapshot pairs} = \frac{\text{Total capacity of P-VOLs}}{\left\{ \frac{\text{Capacity of one P-VOL}}{524,288} \right\} \times 524,288}$$

524,288: Unit by which pool association information manages the capacity of a P-VOL (in kilobytes)

You must round up the value enclosed by the two upward arrows (\uparrow) to the nearest whole number.

NOTE: Pool association information manages the P-VOL capacity by 524,288 KB.

To calculate the total capacity of P-VOLs, use the following formula:

$$\text{Total capacity of P-VOLs} = \left(\frac{S_1}{8,736} \right) \times 2,048 \times 256$$

S1: Shared memory capacity for pool association information (in bytes)

8,736: Capacity of pool association information per one table (in bytes)

2,048: Number of slots of the P-VOL which can be managed by the pool association information for one table

256: Capacity of one slot (in kilobytes)

Note that you must round up the value enclosed by the two upward arrows (\uparrow) to the nearest whole number.

To calculate S1 (shared memory capacity for pool association information), use the following formula:

$$S_1 = S - S_2 - 10,485,760$$

S: Shared memory capacity for the whole V-VOL management area (in bytes)

S2: Shared memory capacity for the pool management block (in bytes)

10,485,760: Fixed management information (in bytes)

NOTE: You can check the capacity of the shared memory of the pool association information and the pool management block in the XP Snapshot window. See "XP Snapshot Window" (page 53). For the capacity of the shared memory for the whole V-VOL management area, see "Additional Shared Memory for the V-VOL Management Area" (page 37).

To calculate S2 (shared memory capacity for pool management block), use the following formula:

$$S2 = \lceil \{ (P \div 256) \times 32 \} \div 8,736 \rceil \times 8,736 + \lceil \{ (Y \div 256) \div 270 \} \div 2,048 \rceil \times 8,736$$

P: Total capacity of all pools (in kilobytes)

Y: Total capacity of the pool-VOLs (in kilobytes)

256: Capacity of one slot (in kilobytes)

32: Capacity of the table which you need to manage the pool of one slot

8,736: Minimum size of the pool management block (in bytes)

270: Number of slots that can be managed by the slot management table

2,048: Number of slots that can be managed by the pool management block of the minimum size

Note that you must round up the value enclosed by the two upward arrows (\lceil) to the nearest whole number.

To calculate P (total capacity of all pools), use the following formula:

$$P = Y - (4,116,000 + 84,000 \times \text{Number of pool-VOLs})$$

Following are notes on calculating the usage of a pool:

- When copying snapshot data to the pool, XP Snapshot always consumes a multiple of 256 kB of the capacity of the pool. 256 kB will be consumed even if the snapshot data is smaller than 256 kB.
- When snapshot data is stored consecutively, the capacity of the snapshot data and the usage of the pool will be almost the same. However, the usage of the pool will be larger than the capacity of the snapshot data in some cases, when snapshot data is stored randomly.

When the shared memory capacity for the whole V-VOL management area (S in the previous formula) is 1,024 MB, the capacity of the pool-VOL (Y in the previous formula) is 4 TB (4,294,967,296 kB), the number of the pool-VOLs is 100, and the capacity of one P-VOL is 10 GB, the number of XP Snapshot pairs that can be created for a subsystem can be calculated as follows.

Example

$$\begin{aligned} P &= 4,294,967,296 \quad (4,116,000 + 84,000 \times 100) \\ &= 4,282,451,296 \end{aligned}$$

$$\begin{aligned} S2 &= \lceil \{ (4,282,451,296 \div 256) \times 32 \} \div 8,736 \rceil \times 8,736 + \\ &\quad \lceil \{ (4,282,451,296 \div 256) \div 270 \} \div 2,048 \rceil \times 8,736 \\ &= \lceil 61,275.917\dots \rceil \times 8,736 + \lceil 30.252\dots \rceil \times 8,736 \\ &= 61,276 \times 8,736 + 31 \times 8,736 \\ &= 535,577,952 \end{aligned}$$

$$\begin{aligned} S1 &= 1,073,741,824 - 535,577,952 - 10,485,760 \\ &= 527,678,112 \end{aligned}$$

$$\begin{aligned} \text{Total capacity of P-VOLs (kB)} &= \lceil (527,678,112 \div 8,736) \rceil \times 2,048 \times 256 \\ &= \lceil 60,402.714\dots \rceil \times 2,048 \times 256 \\ &= 60,403 \times 2,048 \times 256 \\ &= 31,668,568,064 \end{aligned}$$

Maximum number of XP Snapshot pairs =

$$\begin{aligned} \text{Maximum number of XP Snapshot pairs} &= 31,668,568,064 \div \end{aligned}$$

$$\begin{aligned}
 & \left[\frac{(10 \times 1,024 \times 1,024)}{524,288} \right] \times 524,288 \\
 & = \frac{31,668,568,064}{10,485,760} \\
 & = 3,020
 \end{aligned}$$

According to the result, the maximum number of XP Snapshot pairs that can be created is 3,020. If shared memory is added to your storage system and you know the pool capacity, you can roughly estimate the capacity of a P-VOL that can be created, see [Table 18 \(page 39\)](#). To calculate the actual capacity of a P-VOL that can be created, use the above formulas.

Table 18 Rough Estimate of the Capacity of a P-VOL to be created

If a Shared Memory is Added to		And If the Pool Capacity is								
		2,048 GB	4,096 GB	6,144 GB	8,192 GB	10,240 GB	12,288 GB	14,336 GB	20,480 GB	30,720 GB
XP24000 Disk Array	XP Snapshot 1	25.0 TB	10.5 TB	—	—	—	—	—	—	—
	XP Snapshot 2	42.0 TB	28.0 TB	13.5 TB	—	—	—	—	—	—
	XP Snapshot 3	100.0 TB	85.0 TB	71.0 TB	56.0 TB	42.0 TB	28.0 TB	13.5 TB	—	—
	XP Snapshot 4	164.0 TB	149.0 TB	134.0 TB	120.0 TB	106.0 TB	92.0 TB	77.5 TB	29.0 TB	—
	XP Snapshot 5	224.0 TB	209.0 TB	194.0 TB	184.0 TB	170.0 TB	156.0 TB	141.5 TB	89.0 TB	14.0 TB
XP20000 Disk Array		25.0 TB	10.5 TB	—	—	—	—	—	—	—

— Not applicable

Calculating the Number of XP Snapshot Pairs Using the Number of Pair Tables

Pair tables are used by Compatible FlashCopy Version 2 and XP Snapshot pairs in order to store control information which is needed to manage the pairs. To create a Compatible FlashCopy Version 2 pair or an XP Snapshot pair, you need one pair table for each pair.

Up to 1,048,575 pair tables are available in one subsystem.

Among storage system program products, only Compatible FlashCopy Version 2 and XP Snapshot use pair tables. Therefore, if you use Compatible FlashCopy Version 2, the number of available pair tables for XP Snapshot pairs can be calculated by subtracting the number of differential tables used by the Compatible FlashCopy Version 2 pairs from the number of pair tables for the whole subsystem.

For information about how to check the number of pair tables used by Compatible FlashCopy Version 2 pairs (that is, the number of already created Compatible FlashCopy Version 2 pairs), see the *HP StorageWorks XP24000/XP20000 for FlashCopy Mirroring Software User Guide*.

For example, when the number of pair tables used by Compatible FlashCopy Version 2 is 30,000, the number of XP Snapshot pairs that can be created for a subsystem can be calculated as follows.

Example

$$1,048,575 - 30,000 = 1,018,575$$

According to this result, the maximum number of XP Snapshot pairs that can be created is 1,018,575.

Performance Considerations

If XP Snapshot performs a restore operation when the load of the subsystem is heavy, it is more likely that host server I/O performance (response) may be degraded. The Copy Threshold option allows you to effectively decrease the load of the subsystem.

Notes on Defining Pool Capacity

The pool capacity is the total capacity of the pool volumes that are defined in the pool. If the pool capacity is not enough, the status of the XP Snapshot pairs could change to PSUE. When you create a pool, you must estimate the copy capacity (that is, the capacity of the snapshot data to be copied to the pool) and set enough pool capacity for the estimated copy capacity. If the copy capacity would change according to the period of time, set enough pool capacity for the largest copy capacity.

- When snapshot data is copied to a pool, a multiple of 256 kB of the pool will be consumed. Even if the capacity of the snapshot data is less than 256 kB, you need a 256 kB area in the pool for the data.
- If the same area in the P-VOL is updated more than one time, the snapshot data for the area is copied to the pool only when the first update has taken place. Therefore, when the same area in the P-VOL is updated only once, the written data capacity is equal to the copied data capacity. However, when the same area in the P-VOL is updated repeatedly, the copy capacity will be smaller than the written data capacity.
- HP recommends that you use a volume whose capacity is a multiple of 256 kB as a pool-VOL. If the capacity of the volume that is specified as a pool-VOL is not a multiple of 256 kB, the capacity that is less than 256 kB will be rounded off. For example, if you add a volume of 100.125 MB as a pool-VOL, 125 kB will be rounded off and the capacity of the pool will increase only by 100 MB.

When you estimate the copy capacity, you need to consider how many generations of snapshot data you would like to take.

- In case of one snapshot data

If the same area in the P-VOL is updated only once, the copy capacity is equal to the capacity of the data that is written between the storing and the deletion of the snapshot data.

For example, if you want make a backup by using XP Snapshot, you can back up the data from the S-VOL after storing the snapshot data, and then delete the snapshot data. In this case, only the data that was written during the backup needs to be copied to the pool, and there is only one snapshot data. Therefore, you can make a backup with the pool that has a small capacity. However, because you need to read a large amount of data from the S-VOL during the backup, the access to the P-VOL increases and consequently the host I/O performance may be lowered.

- In case of multiple snapshot data

After storing each snapshot data, if the same area in the P-VOL is updated only once until the snapshot data is deleted, the copy capacity is equal to the capacity of the data that is written between the storing and the deletion of the snapshot data. If there is more than one P-VOL, the copy capacity is equal to the total capacity of the data written to each P-VOL.

When you store more than one snapshot data in the pool, some XP Snapshot pairs may share snapshot data in the pool. While the snapshot data is shared, you can delete the pairs but cannot delete the shared snapshot data from the pool. The shared snapshot data will not be deleted from the pool until all the XP Snapshot pairs that share the snapshot data are deleted.

Though you estimate the copied data capacity and set the pool capacity according to the notes in this section, if the pool capacity exceeds the threshold, see “[Troubleshooting](#)” (page 98) and implement measures.

Notes on Using External Volumes as Pool-VOLs

By using XP External Storage, you can connect multiple storage systems to the XP24000/20000 Disk Array single storage system. In that case, the original storage system is called the local storage system, and the connected storage systems are called external storage systems. A volume in an external storage system is called an external volume. A volume in the local storage system is called an internal volume.

If XP External Storage is installed, as well as internal volumes, external volumes can be used as pool-VOLs. However, external volumes are more likely to fail than internal volumes. In addition, solutions for external volume failures are more complicated than those for internal volume failures. To minimize the effects of the failures, HP recommends that you use external volumes as follows:

- Specify the external volumes of only one external subsystem for one pool.
- Do not specify both internal and external volumes as pool-VOLs in one pool.

You may specify the external volumes of several external subsystems for one pool, or use both internal and external volumes as pool-VOLs in one pool, but in that case, consider that problems such as volume blockade may more easily happen. For example, if a problem occurs and the external volume which is being used as a pool-VOL is blocked, the pool becomes blocked as well. For information about how to recover the blocked pool, see "[Procedure to Recover a Blocked Pool](#)" ([page 101](#)).

For details about external subsystems and the solutions for the errors related to external volumes, see the *HP StorageWorks XP24000/XP20000 External Storage Software User Guide*.

Requirements for Maintaining XP Snapshot

This section describes the notes on switching off the power supply or replacing the microcode offline while XP Snapshot is in use.

Notes on Replacing the Microcode Offline

Usually, replacement of microcode is performed online, but in some cases, such as when the configuration of the shared memory needs to be changed, replacement of microcode will be performed offline. If the microcode is replaced offline, pool information or XP Snapshot pair information in the shared memory will be lost. Therefore, you need to create the pools and the pairs again after the microcode is replaced.

Notes on Switching Off the Power Supply

Before you switch off the power supply while XP Snapshot is running, stop the host I/O operations. When you switch on the power supply again, XP Snapshot behaves differently according to whether information in the shared memory remains before and after switching off the power supply.

- If information in the shared memory remains before and after switching off the power supply
If information in the shared memory remains before and after switching off the power supply, usually you can use the pools and the XP Snapshot pairs that you had been using before the switch-off. However, because the storage system checks the status of the pools and the pool volumes, if the pool volumes are blocked at that moment, the pool will be blocked and the status of the XP Snapshot pairs changes to PSUE. When this occurs, you need to recover the pools after the switch-on. For details about recovering the pools, see "[Procedure to Recover a Blocked Pool](#)" ([page 101](#)).

When you store snapshot data by a consistency group, if the power supply is switched off before the status of all the pairs in the same consistency group has changed completely, the

storing of snapshot data will not resume, and the status of some pairs may remain unchanged when the power supply is switched again.

- If information in the shared memory is lost after switching off the power supply

The storage system has a battery to maintain the information in the shared memory. However, when a certain time elapses after the breaker is turned off, the battery will die and the information in the shared memory will be lost. If information in the shared memory is lost after switching off the power supply, the information about the pools and the XP Snapshot pairs is erased. Therefore, you need to create the pools and the pairs again after the switch-on.

For information about the amount of time before the information in the shared memory is lost when the breaker is turned off, ask HP technical support.

Installing and Uninstalling XP Snapshot

This section describes the procedure for installing and uninstalling XP Snapshot.

Installing XP Snapshot

The following steps describe the installation procedure for XP Snapshot:

1. Install additional shared memory for differential tables.
 2. Install additional shared memory for the V-VOL management area.
 3. Install XP Business Copy, which is the prerequisite program product for XP Snapshot.
 4. Install XP Snapshot.
- Call HP technical support to install additional shared memory for the V-VOL management area. The shared memory for XP Snapshot and the shared memory for XP Thin Provisioning must be installed separately.
 - Once you install additional shared memory for the V-VOL management area, you cannot uninstall it partially. To uninstall the additional shared memory for the V-VOL management area, you need to uninstall the whole shared memory that was added for the V-VOL management area.
 - Skip [Step 1](#) if the shared memory for differential tables is already installed.
 - [Step 1](#) and [Step 2](#) are interchangeable.
 - Skip [Step 3](#) if XP Business Copy is already installed to the storage system.
 - Because the total capacity of XP Snapshot P-VOLs and pools will be considered as the capacity used by XP Snapshot, you need to purchase enough license capacity for them.

Uninstalling XP Snapshot

The following steps describe the uninstallation procedure for XP Snapshot:

1. Delete all XP Snapshot pairs.
2. Delete all pools.
3. Delete all V-VOLs.
4. Uninstall XP Snapshot.

For detailed information about the procedures for deleting the pairs, pools, and V-VOLs, see ["Performing XP Snapshot Operations" \(page 66\)](#).

Starting XP Snapshot

After you have enabled the feature for the Remote Web Console and prepared for XP Snapshot operations, you are ready to start up XP Snapshot. However, because XP Snapshot does not have its own starting menu, you need to start up XP Business Copy and LUN Expansion (LUSE)/Virtual LVI/LUN (VLL) in order to use XP Snapshot.

To start XP Business Copy or LUN Expansion (LUSE)/Virtual LVI/LUN (VLL) and display the window:

1. Display the Remote Web Console main window.

For information about how to display the Remote Web Console main window, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

2. Click **Go** and then **XP Business Copy** or **Volume Manager** on the menu bar of the Remote Web Console main window.

Names of the windows that you need for XP Snapshot operation appear in the submenu.

3. Click the name of the window you want to display.

XP Business Copy or LUN Expansion (LUSE)/Virtual LVI/LUN (VLL) starts, and the window whose name you clicked appears in the submenu.

For details about the displayed windows, see “[Using the XP Snapshot GUI](#)” (page 44).

4 Using the XP Snapshot GUI

XP Snapshot information and operations are presented on Remote Web Console windows that are also used for XP Business Copy and LUN Expansion (LUSE)/Virtual LVI/LUN (VLL). XP Snapshot uses the XP Business Copy Pair Operation, XP Business Copy History, XP Business Copy XP Snapshot, LUSE/VLL Pool, and LUSE/VLL V-VOL windows.

This chapter describes the Remote Web Console windows that present XP Snapshot information and allow you to perform XP Snapshot operations.

- “Pair Operation Window” (page 44)
- “History Window” (page 51)
- “XP Snapshot Window” (page 53)
- “Pool Window” (page 56)
- “V-VOL Window” (page 63)

Pair Operation Window

The XP Business Copy's Pair Operation window displays information about both XP Business Copy and XP Snapshot pairs. This section explains only the items related to the XP Snapshot pairs. For details about the items related to the XP Business Copy pairs, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

Figure 6 Pair Operation Window

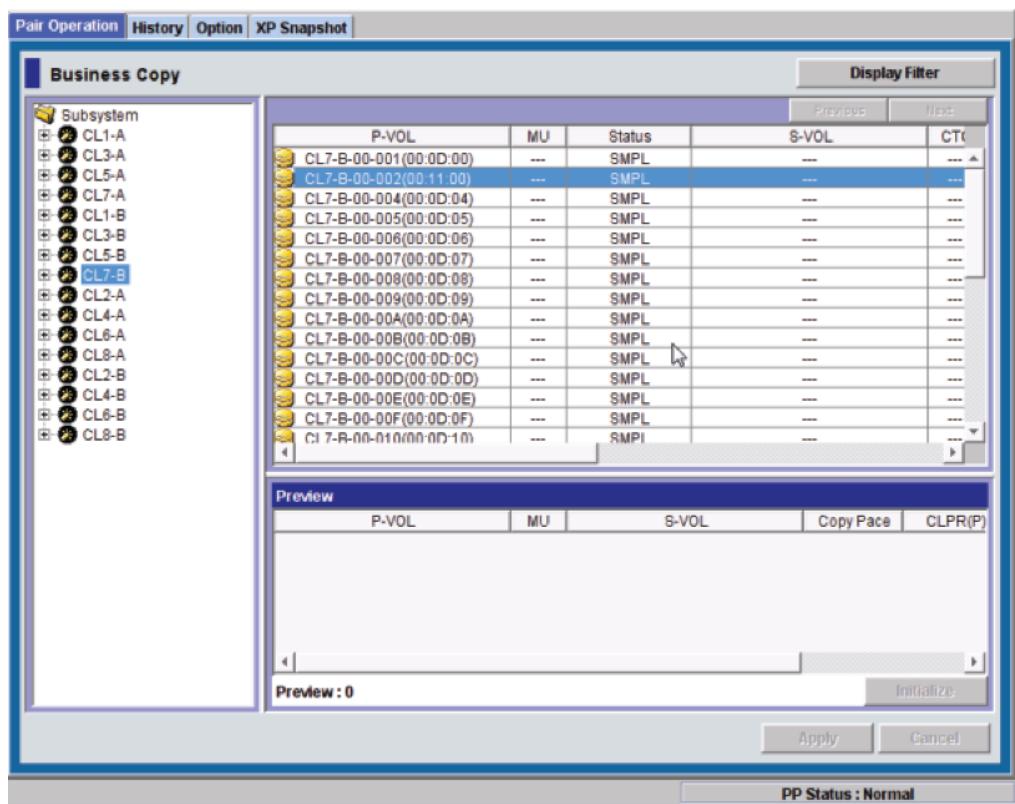


Table 19 Pair Operation Window Items

Item	Description
Display Filter button	Displays the Display Filter dialog box ("Display Filter Dialog Box (XP Snapshot Tab Selected)" (page 68)) where you can filter the volumes displayed in the volume list.
Tree (the area in the left portion of the window)	Displays the ports that are defined paths or host groups, in tree style. When you select the items in the tree, information about XP Business Copy pairs or XP Snapshot pairs will be displayed in the volume list on the right of the window. Note that no volume will be displayed when you select Subsystem , which is shown in the top of the tree.
Volume list (the area in the upper right portion of the window)	Displays all available volumes.
Icons	<p>The following are the XP Snapshot icons and their meanings. For the icons related to XP Business Copy, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i>.</p> <ul style="list-style-type: none"> disk subsystem (storage system) port host group LUN or SMPL volume XP Snapshot pair
Preview (the area under the volume list)	Displays the operations that have been performed in the Pair Operation window, but are still not applied to the storage system.

Table 19 Pair Operation Window Items (continued)

Item	Description
Apply button	Applies the operations displayed in the Preview list to the storage system. If the specified operations are applied successfully, the Preview list will be cleared. If an error occurs during an operation, the failed operation will remain in the Preview list with an error icon (●) displayed in front. Details about the error (error code and message) are displayed on the error dialog box. For details about the error codes of XP Snapshot, see <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i> .
Cancel button	Cancels all the operations set in the Preview list.

Volume List

The Volume List (see “[Volume List \(page 46\)](#)”) displays volume/pair information for XP Snapshot or XP Business Copy, based on the filter options you select in the tree (along the left side portion of the window). When you select a port or host group in the tree on the left side of the Pair Operation window, information about the volumes that belong to what you selected in the tree will be displayed in the volume list. You can sort the volumes by any of the items displayed as the column header of the Volume List. You can also filter the volumes by reserve attribute, pair condition, and pair status using the Display Filter dialog box.

The number of volumes that can be displayed in the Volume List at the same time is limited to 1,024 volumes. In case the number of volumes defined in the storage system exceeds this limit, use the **Previous** and **Next** buttons on the upper right of the Volume List to turn the pages of the Volume List and see the entire list.

Figure 7 Volume List

P-VOL	MU	Status	S-VOL	CTG
CL5-D-00-000(00:16:00)	1	PAIR	CL5-D-00-07F(00:16:7F)	...
CL5-D-00-001(00:16:01)	---	SMPL	---	---
CL5-D-00-002(00:16:02)	---	SMPL	---	---
CL5-D-00-003(00:16:03)	---	SMPL	---	---
CL5-D-00-004(00:16:04)	---	SMPL	---	---
CL5-D-00-005(00:16:05)	---	SMPL	---	---
CL5-D-00-006(00:16:06)	---	SMPL	---	---
CL5-D-00-007(00:16:07)	---	SMPL	---	---
CL5-D-00-008(00:16:08)	---	SMPL	---	---
CL5-D-00-009(00:16:09)	---	SMPL	---	---
CL5-D-00-00A(00:16:0A)	---	SMPL	---	---
CL5-D-00-00B(00:16:0B)	---	SMPL	---	---
CL5-D-00-00C(00:16:0C)	---	SMPL	---	---
CL5-D-00-00D(00:16:0D)	---	SMPL	---	---
CL5-D-00-00E(00:16:0E)	---	SMPL	---	---

Table 20 Volume List Items

Item	Description
Previous button	Displays the previous page of the volume list when the total number of the volumes in the storage system is more than 1,024, the Previous button. If the number of the items in the volume list is less than 1,024, this button is grayed out.
Next button	Displays the next page of the volume list when the total number of the volumes in the storage system is more than 1,024, the Next button. If the number of the items in the volume list is less than 1,024, this button is unavailable.

Table 20 Volume List Items (continued)

Item	Description
Message	Displays when there is no volume or pair to be displayed. If you see the message in the Volume List, click a different icon in the tree on the left area of the Pair Operation window.
P-VOL	<p>Displays information about P-VOL in AAA-BB-CCC(XX:YY:ZZ) format.</p> <ul style="list-style-type: none">• AAA: The port ID (cluster and channel number)• BB: The group number of the host group• CCC: LU number• XX:YY:ZZ: LDKC number:CU number:LDEV number <p>An LDEV number that ends with # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with a letter X indicates that the LDEV is a virtual volume used by Dynamic Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.</p>
MU	Displays the snapshot ID of an XP Snapshot pair. If the pair is in SMPL status, three hyphens (---) will be displayed. For details about what will be displayed in this item if you select XP Business Copy pairs, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i> .
Status	Displays the status of an XP Snapshot pair or an XP Business Copy pair. For details about the status of an XP Snapshot pair, see “ Status of the XP Snapshot Pairs ” (page 14). For details about the XP Business Copy pair status, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i> .
S-VOL	<p>Displays information about S-VOL in AAA-BB-CCC(XX:YY:ZZ) format.</p> <ul style="list-style-type: none">• AAA: The port ID (cluster and channel number)• BB: The group number of the host group• CCC: LU number• XX:YY:ZZ: LDKC number:CU number:LDEV number <p>For LUs with more than one path, only one path is listed. The path is connected to the first port within the ports configured to a path that are shown in the tree view of the Pair Operation Window.</p> <p>An LDEV number that ends with # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.</p>

Table 20 Volume List Items (continued)

Item	Description
CTG	Displays the consistency group number of the XP Snapshot pair. When the consistency group is not specified, dotted lines (---) are displayed. For information about what will be displayed for an XP Business Copy pair, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i> .
SvolMode	Displays the status of the S-VOL. When the data is not written in the S-VOL, (---) appears. When the data is written in the S-VOL, W appears. For information about what is displayed for an XP Business Copy pair, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i> .
Copy Pace	Displays dotted lines (---). For information about what is displayed for an XP Business Copy pair, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i> .
Sync.	Displays the consistency rate of the P-VOL and the S-VOL for the XP Snapshot pair. Displayed information changes according to the pair status. See " Information Displayed in Sync. " (page 48).
Emulation	Displays the emulation type of the volume.
Capacity(MB)	Displays the storage capacity of the volume. The unit is megabyte (MB).
CLPR(P)	Displays the cache logical partition of the P-VOL.
CLPR(S)	Displays the cache logical partition of the S-VOL.
Menu	Displays the menus in " Menus of the Volume List of XP Business Copy's Pair Operation Window (In Case an XP Snapshot Pair Is Selected) " (page 49) when you select and right-click the XP Snapshot pair volumes in the volume list.

Table 21 Information Displayed in Sync.

Pair Status	Displayed Information
SMPL	(---) is displayed.
COPY	The consistency rate of the P-VOL and the S-VOL is displayed by percent (%).
PAIR	
COPY(RS)	
COPY(RS-R)	
PSUS	
PSUE	(---) is displayed.
SMPL(PD)	

For information about what is displayed if it is an XP Business Copy pair, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

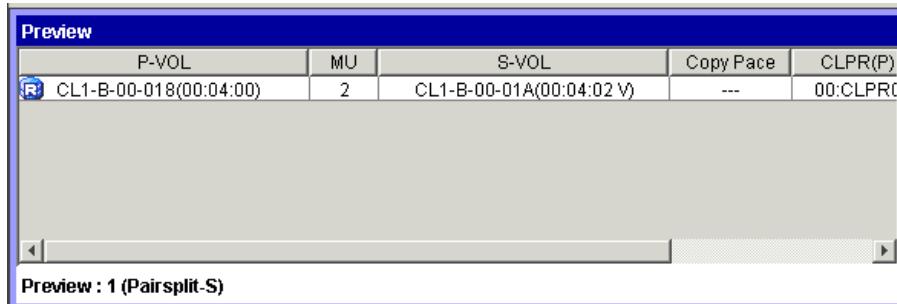
Table 22 Menus of the Volume List of XP Business Copy's Pair Operation Window (In Case an XP Snapshot Pair Is Selected)

Command	Function
Detail	Opens the Detail dialog box ("Detail Dialog Box for an XP Snapshot Pair" (page 92)).
Pairsplit-S	Opens the Pairsplit-S dialog box ("Pairsplit-S Dialog Box" (page 90)).
S-VOL Path	Opens the S-VOL Path dialog box ("S-VOL Path Dialog Box" (page 93)).
Information	Opens the Information dialog box (see "Information Dialog Box" (page 95)), which displays the number of pairs or reserved volumes.

- The grayed-out commands are for XP Business Copy pairs. For details about these commands, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.
- When you select the `Paircreate` or the `Pairsplit` command from the menu, the `Paircreate` dialog box or the `Pairsplit` dialog box will be displayed. However, you cannot create or split XP Snapshot pairs by using these dialog boxes.

Preview List

The **Preview** list is in the lower right portion of the XP Business Copy's Pair Operation window. The **Preview** list displays the content of XP Business Copy or XP Snapshot operations that are not applied to the storage system yet.

Figure 8 Preview List**Table 23 Preview List Items**

Item	Description
P-VOL	<p>Displays information about the P-VOL in AAA-BB-CCC(XX:YY:ZZ) format.</p> <ul style="list-style-type: none"> AAA: The port ID (cluster and channel number) BB: The group number of the host group CCC: LU number XX:YY:ZZ: LDKC number:CU number:LDEV number <p>An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.</p>
MU	<p>Displays the ID for the XP Snapshot pair. If the pair is in SMPL status, --- will be displayed. For details about what will be displayed in this item if you select XP Business Copy pairs, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i>.</p>
S-VOL	<p>Displays information about the S-VOL in AAA-BB-CCC(XX:YY:ZZ) format.</p> <ul style="list-style-type: none"> AAA: The port ID (cluster and channel number) BB: The group number of the host group CCC: LU number XX:YY:ZZ: LDKC number:CU number:LDEV number <p>An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.</p>
Copy Pace	<p>Displays dotted lines ---. For information about what will be displayed for an XP Business Copy pair, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i>.</p>

Table 23 Preview List Items (continued)

Item	Description
CLPR(P)	Displays the cache logical partition of the P-VOL.
CLPR(S)	Displays the cache logical partition of the S-VOL.
Error Code	Displays the code that indicates the cause of the error. If there is no error, dotted lines (---) will display.
Menu	When you select and right-click items in the Preview list, the menu displays the following commands: <ul style="list-style-type: none"> Delete: Cancels the selected operation(s) in the Preview list. Error Detail: Displays the error message box, which displays the error code and message. For the XP Snapshot error codes, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i>. Note: The grayed out commands are for XP Business Copy pairs. For details about those commands, see the <i>HP StorageWorks XP24000/XP20000 Business Copy Software User Guide</i>.
Preview X(Y)	X indicates the total number of the operations displayed in the Preview list. Y indicates the type of operation.

History Window

The History window (see [Figure 9 \(page 51\)](#)) displays the past record of pair operations performed on the XP Snapshot pairs, such as creating or deleting pairs and storing snapshot data.

Figure 9 History Window

The History window displays two separate tables of historical operations:

Business Copy History

Date	P-VOL	S-VOL	Code	Message
2007/09/26 14:37:59	00:00:07	00:00:09	4760	COPY(RS) END
2007/09/26 14:37:58	00:00:07	00:00:09	4750	COPY(RS) START
2007/09/26 14:26:36	00:00:07	00:00:09	4740	PSUS END
2007/09/26 14:26:36	00:00:07	00:00:09	4730	PSUS START
2007/09/26 14:16:27	00:01:02	00:01:03	4720	PAIR END
2007/09/26 14:15:24	00:01:01	00:01:02	4720	PAIR END
2007/09/26 14:15:22	00:01:02	00:01:03	4710	PAIR START
2007/09/26 14:14:21	00:01:01	00:01:02	4710	PAIR START
2007/09/26 10:44:06	00:0B:00	00:0B:03	4720	PAIR END
2007/09/26 10:44:54	00:0B:01	00:0B:03	4720	PAIR END

XP Snapshot History

Date	P-VOL	S-VOL	MU	Pool ID	Code	Mess
2007/07/07 10:33:18	---	---	---	---	2041	INITIALIZE
2007/07/07 10:33:12	---	---	---	---	2040	INITIALIZE
2007/06/25 18:14:15	00:0B:61	00:D0:07	0	70	2001	PAI
2007/06/01 10:43:08	00:0B:61	00:D0:07	0	70	2021	SMF
2007/05/31 17:14:56	00:0B:61	00:D0:07	0	70	2001	PAI
2007/05/30 16:03:09	---	---	---	---	2041	INITIALIZE
2007/05/30 16:03:03	---	---	---	---	2040	INITIALIZE
2007/05/30 16:00:13	---	---	---	---	2041	INITIALIZE
2007/05/30 16:00:08	---	---	---	---	2040	INITIALIZE
2007/05/30 15:56:51	---	---	---	---	2041	INITIALIZE

The upper area of the History window lists the operation history for XP Business Copy pairs, and the lower area of the window lists the operation history of XP Snapshot pairs. For details about the operation history of XP Business Copy pairs, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*. The lower portion of the History window displays the following items.

Table 24 History Window Items

Item	Description
Previous button	Allows you to return to the previous page of the list. This button is selectable only when the number of operation histories in the storage system exceeds 16,384, which is the maximum number of histories that can be displayed on one page. The button is grayed-out if the total number of operation histories in the storage system is less than 16,384.
Next button	Allows you to turn to the next page of the list. This button is selectable only when the number of operation histories in the storage system exceeds 16,384 volumes, which is the maximum number of histories that can be displayed on one page. The button is grayed-out if the total number of operation histories in the storage system is less than 16,384.
Date	Displays the date and time (YYYY/MM/DD hour/min/sec) when an XP Snapshot pair or volume operation has been performed.
P-VOL	Displays the CU number and LDEV number of a P-VOL used for an XP Snapshot operation. An LDEV number that ends with a # mark indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with a letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding the external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i> . For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i> .
S-VOL	Displays the CU number and LDEV number of an S-VOL used for an XP Snapshot operation. When there is no S-VOL, --- will be displayed. An LDEV number that ends with a V indicates that the LDEV is a virtual volume (for example, 00:00:01V).
MU	Displays the XP Snapshot data ID of snapshot data used for an XP Snapshot operation.
Pool ID	Displays the Pool ID of the pool in which the XP Snapshot pair is registered.
Code	Displays the reference code for XP Snapshot. For details on the reference code, see Table 25 (page 52) .
Message	Displays the message that indicates the operation or status of an XP Snapshot pair. See Table 25 (page 52) .

Table 25 XP Snapshot History Reference Codes and Messages

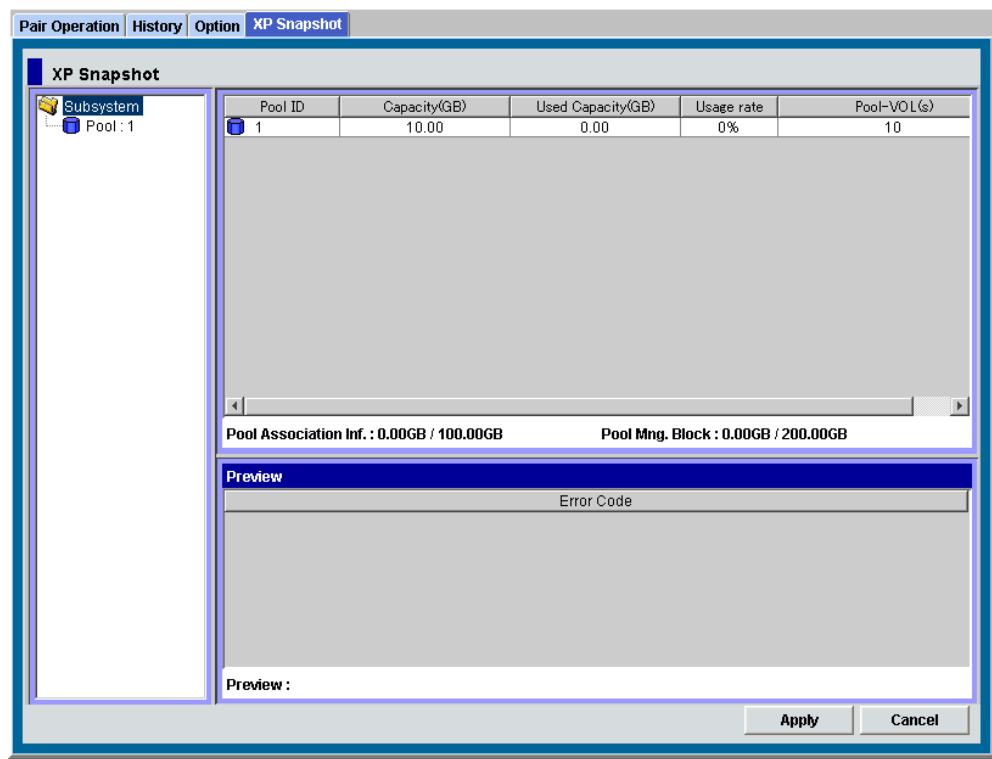
Code	Message	Description
0x2001	PAIR	An XP Snapshot pair was created.
0x2011	PSUS	An XP Snapshot pair was split.
0x2021	SMPL	An XP Snapshot pair was deleted.
0x2030	COPY(RS-R) START	Restoration of an XP Snapshot pair started.
0x2031	COPY(RS-R) END	Restoration of an XP Snapshot pair ended normally.

Table 25 XP Snapshot History Reference Codes and Messages (continued)

Code	Message	Description
0x2032	COPY(RS-R) ENDED ABNORMAL	Restoration of an XP Snapshot pair ended abnormally.
0x2051	COPY(RS)	Snapshot data was deleted.
0x2070	PSUE(ABNORMAL END)	A failure occurred and the status of the XP Snapshot pair changes to PSUE.
0x2040	INITIALIZE START	Initialization started.
0x2041	INITIALIZE END	Initialization ended normally.
0x2042	INITIALIZE ENDED ABNORMAL	Initialization ended abnormally.

XP Snapshot Window

Figure 10 (page 53) allows you to see information on pools that are created for XP Snapshot.

Figure 10 XP Snapshot Window

The XP Snapshot window displays the following items.

Table 26 The XP Snapshot Window Display

Item	Description
Tree (the area in the left portion of the window)	<p>Pools in the disk storage system are displayed in the tree style. The following icons are displayed in the tree.</p> <ul style="list-style-type: none"> ● storage system ● Pool: X : pool in normal status (X indicates pool ID) ● Pool: X : pool whose usage rate exceeds the threshold (X indicates pool ID) ● Pool: X : blocked pool (X indicates pool ID)
Pool/volume list (in the upper right portion of the window)	<p>If you select Subsystem in the tree, the pool/volume list displays the list of the pools in the storage system. When you select Subsystem in the tree, the following items will be displayed in the pool/volume list.</p> <ul style="list-style-type: none"> ● Pool ID: pool ID ● Capacity(GB): storage capacity of the pool ● Used Capacity(GB): capacity of the pool that is used by the XP Snapshot pairs ● Usage rate: usage rate of the pool ● Pool-VOL(s): total number of the pool-VOLs in the pool ● XP Snapshot pair(s): total number of snapshot data stored in the pool <p>If you select a pool icon in the tree, the pool/volume list displays the list of the XP Snapshot pairs in the pool. When you select a pool icon in the tree, the following items will be displayed in the pool/volume list.</p> <ul style="list-style-type: none"> ● P-VOL: port ID, the group number of the host group, and LUN (LDKC number, CU number, and LDEV number of the volume) of the P-VOL. For P-VOL LUs with more than one path, only one path is listed. The path is connected to the first port within the ports configured to a path that is shown in the tree view of the Pair Operation Window. ● MU: snapshot ID ● Status: status of the XP Snapshot pair ● S-VOL: port ID, the group number of the host group, and LUN (LDKC number, CU number, and LDEV number of the volume) of the S-VOL. For S-VOL LUs with more than one path, only one path is listed. The path is connected to the first port within the ports configured to a path that is shown in the tree view of the Pair Operation Window. When the volume is unmounted, dotted lines (---) will display. ● Pool used(GB): capacity of the pool that is used by the S-VOL ● Sync.: consistency rate of the data of the P-VOL and the S-VOL ● CTG: consistency group number of the XP Snapshot pair When the consistency group is not specified, dotted lines (---) will display.

Table 26 The XP Snapshot Window Display (continued)

Item	Description
Pool Association Inf.: X GB / Y GB	<p>X indicates the capacity of the pool association information in use.</p> <p>Y indicates the maximum possible capacity of the pool association information, including the capacity of the pool association information in use.</p> <p>The maximum possible capacity of pool association information is calculated, based on the assumption that the remaining space of the V-VOL management area is used as pool association information. If the remaining space of the V-VOL management area is used for pool management blocks, the maximum possible capacity of pool association information is decreased due to decrease in the remaining space of the V-VOL management area.</p>
Pool Mng. Block: X GB / Y GB	<p>X indicates the capacity of the pool management blocks in use.</p> <p>Y indicates the maximum possible capacity of the pool management blocks, including the capacity of the pool management blocks in use.</p> <p>The maximum possible capacity of pool management blocks is calculated, based on the assumption that the remaining space of the V-VOL management area is used as pool management blocks. If the remaining space of the V-VOL management area is used for pool association information, the maximum possible capacity of pool management blocks is decreased due to decrease in the remaining space of the V-VOL management area.</p> <p>Pool association information and a pool management block are the elements of the V-VOL management area. You need to know the capacity of these two elements to calculate the number of XP Snapshot pairs you can create. For information about how to calculate the number of XP Snapshot pairs you can create, see "Calculating the Maximum Number of Pairs" (page 36).</p>
Menu (pool/volume list)	<p>When you select a pool icon in the tree, and then select and right-click the XP Snapshot pairs in the pool/volume list, a menu Pairsplit-S will be displayed. If you select this menu, the Pairsplit-S dialog box ("Pairsplit-S Dialog Box" (page 90)) will be displayed.</p>
Preview list	<p>Displays the content of the operations that have been set or specified in the XP Snapshot window, but are still not applied to the storage system. To apply the operations displayed in the Preview list to the storage system, click Apply.</p> <p>The Preview list displays the following items.</p> <ul style="list-style-type: none">• P-VOL: port ID, the group number of the host group, and LUN of the P-VOL• MU: snapshot ID• S-VOL: port ID, the group number of the host group, and LUN of the S-VOL• Error Code: code that indicates the cause of the error. If there is no error, --- will be displayed• Preview X(Y): total number of the operations displayed in the Preview list (X) and the type of operation (Y)

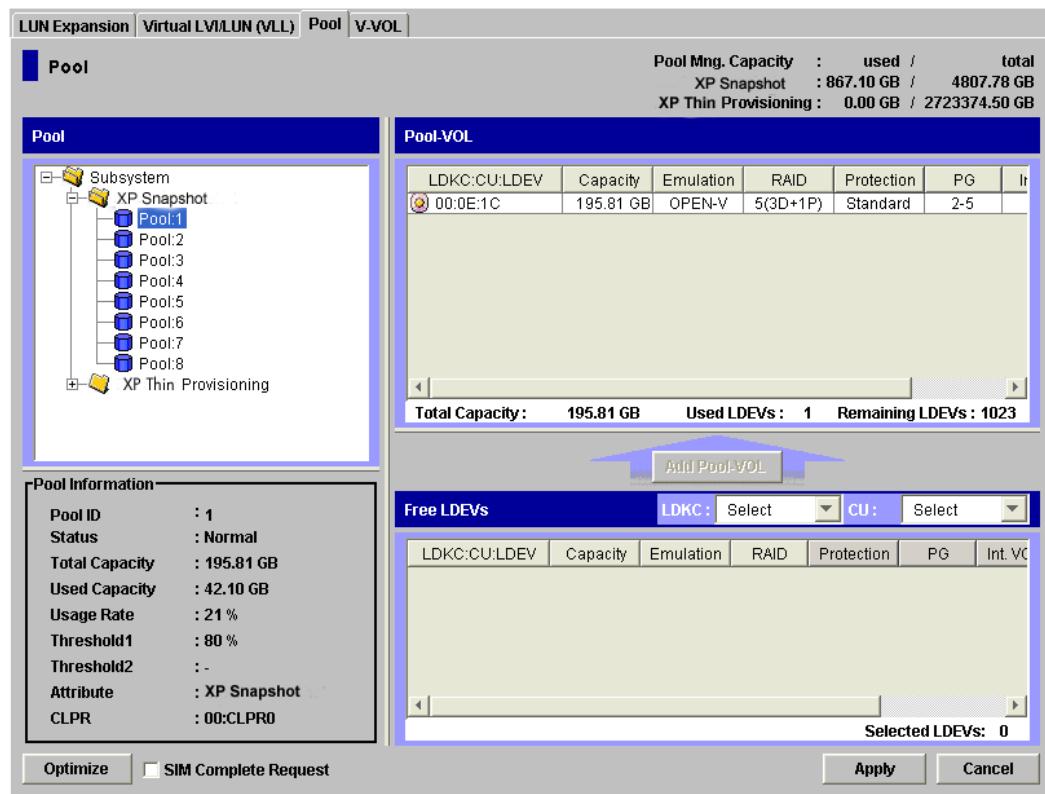
Table 26 The XP Snapshot Window Display (continued)

Item	Description
Menu (Preview list in the XP Snapshot window)	If you select and right-click the operations in the Preview list, the menu appears. Delete: Cancels the selected operation and deletes the operation from the Preview list in the XP Snapshot window. Error Detail: Displays the error message box, which displays the error code and message. For the XP Snapshot error codes, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i> .
Apply button	Applies the operations displayed in the Preview list to the storage system. If the specified operations complete successfully, the Preview list will be cleared. If an error occurs during an operation, the failed operation will remain in the Preview list. Details about the error (error code and message) are displayed on the error dialog box. For details about the list of the error code for XP Snapshot, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i> .
Cancel button	Cancels all the operations set in the Preview list.

Pool Window

The Pool window allows you to create or delete pools. You can also optimize the V-VOL management area or the pool management block by using the Pool window. For details, see “[Performing XP Snapshot Operations](#)” (page 66).

Figure 11 Pool Window



The Pool window displays the following items.

Table 27 Pool Window Description

Item	Description
Pool Mng. Capacity	<p>The name of the program product that uses pool management capacity is displayed.</p> <ul style="list-style-type: none"> • used Indicates the capacity (GB) of the pool management blocks in use. • total Indicates the maximum possible capacity (GB) of the pool management blocks, including the capacity of the pool management blocks in use. The capacity of pool management blocks is calculated, based on the assumption that the remaining space of the V-VOL management area is used as pool management blocks. If the remaining space of the V-VOL management area is used for pool association information, the maximum possible capacity of pool management blocks is decreased due to decrease in the remaining space of the V-VOL management area. <p>You need to keep the capacity of the pool management blocks in use less than its total capacity.</p> <p>CAUTION: The value displayed for Total Capacity in the Pool Information box and the value displayed for Pool Mng..</p> <p>Capacity : used are approximately equal, but there may be some differences. Also note that even if the value displayed for Total Capacity in the Pool Information box is updated when the pool-VOLs are added to or deleted from the pool, the value displayed for Pool Mng. Capacity : used will not be updated until you click Apply.</p>
Pool tree	<p>Pools in the disk storage system are displayed in a tree style. The following icons are displayed in the tree.</p> <p>The storage system or XP Snapshot or XP Thin Provisioning Software</p> <ul style="list-style-type: none"> • pool: X: A pool in normal status (X indicates the pool ID) • pool: X: A pool whose usage rate exceeds the threshold (X indicates the pool ID) • pool: X: A blocked pool (X indicates the pool ID) • : A normal pool (in the process of being deleted) • : A blocked pool (in the process of being deleted)
Menu	<p>When you select an icon in the Pool tree and right-click the icon, one of the menus in “Menus of the Pool Tree” (page 63) will be displayed.</p>

Table 27 Pool Window Description (continued)

Item	Description
Pool-VOL list	

Table 27 Pool Window Description (continued)

Item	Description
	<p>Information about the pool-VOLs that are registered in the pool selected in the Pool tree. The following items are displayed in the list.</p> <ul style="list-style-type: none">• LDKC:CU:LDEV: LDKC number, CU number, and LDEV number of the pool-VOL An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.• Capacity: capacity of the pool-VOL• Emulation: emulation type of the pool-VOL• RAID: RAID level (--- will be displayed in case of an external volume)• Protection: Data protection level SATA-W/V: Write and Verify method on SATA drives Standard: FC drives, flash drives, external volumes, or V-VOLs HP recommends that the data protection level be the same for pool-VOLs in the same pool.• PG: parity group to which the pool-VOL belongs• Encryption: Status of volume encryption Enable indicates the volume is encrypted. Disable indicates the volume is not encrypted. Hyphen (-) appears if the volume is other than internal volumes.• Int. VOL Info: drive type of internal volumes. Nothing will be displayed for FC drives. An asterisk (*) will be displayed for a SATA drive. A dollar sign (\$) will be displayed for an SSD drive. Three consecutive hyphens (---) will display for an external volume. Pool-VOLs with different drive types cannot be intermixed in the same pool.• Ext. VOL Info: drive type of external volumes. Nothing will be displayed for FC drives. An asterisk (*) will be displayed for a SATA or BD drive. A dollar sign (\$) will be displayed for an SSD drive. Three consecutive hyphens (---) will display for an internal volume. As a best practice, you should specify the same drive type for all pool-VOLs registered in the same pool.• Cache Mode: if the volume is an external volume, cache mode is displayed. This cache mode is specified when the external volume is mapped. Pool-VOLs with different cache modes cannot be intermixed in the same pool.• Total Capacity: total capacity of the pool-VOLs in the pool• Used LDEVs: total number of the pool-VOLs in the pool• Remaining LDEVs: total number of the pool-VOLs that

Table 27 Pool Window Description (continued)

Item	Description
	you can add to the pool
Add Pool-VOL button	Adds the selected volume(s) in the Free LDEVs list as pool VOL(s) to the pool that you selected from the Pool tree.
LDKC drop-down list	If you select a CU number from the drop-down list, the volumes in the CU will be displayed in the Free LDEVs list. Note that if you select an LDKC from the LDKC drop-down list, only the CUs in the selected LDKC are displayed.

Table 27 Pool Window Description (continued)

Item	Description
Free LDEVs list	<p>Among the volumes in the CU which is selected from the CU drop-down list, the volumes that can be specified as pool-VOLs will be displayed. The following items are displayed in the list.</p> <ul style="list-style-type: none">• LDKC:CU:LDEV: LDKC number, CU number, and LDEV number of the volume• An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the <i>HP StorageWorks XP24000/XP20000 External Storage Software User Guide</i>. For information about XP Thin Provisioning, see the <i>HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide</i>.• Capacity: capacity of the volume• Emulation: emulation type of the volume• RAID: RAID level (--- will be displayed in case of an external volume)• Protection: Data protection level<ul style="list-style-type: none">SATA-W/V: Write and Verify method on SATA drivesStandard: FC drives, flash drives, external volumes, or V-VOLsHP recommends that the data protection level be the same for pool-VOLs in the same pool.• PG: parity group to which the volume belongs• Encryption: Status of volume encryption<ul style="list-style-type: none">Enable indicates the volume is encrypted.Disable indicates the volume is not encrypted.Hyphen (-) appears if the volume is other than internal volumes.• Int. VOL Info: drive type of internal volumes. Nothing will be displayed for FC drives. An asterisk (*) will be displayed for a SATA drive. A dollar sign (\$) will be displayed for an SSD drive. Three consecutive hyphens (---) will be displayed for an external volume. Pool-VOLs with different drive types cannot be intermixed in the same pool.• Ext. VOL Info: drive type of external volumes. Nothing will be displayed for FC drives. An asterisk (*) will be displayed for a SATA or BD drive. A dollar sign (\$) will be displayed for an SSD drive. Three consecutive hyphens (---) will be displayed for an internal volume. As a best practice, you should specify the same drive type for all pool-VOLs registered in the same pool.• Cache Mode: if the volume is an external volume, cache mode is displayed. This cache mode is specified when the external volume is mapped. Pool-VOLs with different cache modes cannot be intermixed in the same pool.• CLPR: number of the CLPR to which the volume belongs• Selected LDEVs: total number of the volumes that are selected in the list

Table 27 Pool Window Description (continued)

Item	Description
Pool Information box	<p>Information about the pool that you selected in the Pool tree will be displayed. The following items are displayed in the box.</p> <ul style="list-style-type: none">• Pool ID: number that identifies the pool• Status: status of the pool<ul style="list-style-type: none">◦ Normal: pool is in the normal status◦ Blocked: pool is blocked• Total Capacity: total capacity of the pool• Used Capacity: used capacity of the pool• Usage Rate: proportion of the used pool capacity to the total pool capacity (%) If the usage rate exceeds the threshold, Warning will be displayed after the usage rate. If the usage rate reaches 100 %, Error will be displayed after the usage rate.• You can set two thresholds for a pool; however, only one threshold is available for a pool in XP Snapshot.<ul style="list-style-type: none">◦ Threshold 1: Threshold for pool usage rate (%). Default setting is 80%. Threshold 1 can be changed from 20% to 95% in 5% increments.◦ Threshold 2: Because XP Snapshot does not use Threshold 2, a hyphen (-) will be displayed.• Attribute: program product that uses the pool<ul style="list-style-type: none">◦ XP Snapshot: XP Snapshot◦ XP Thin Provisioning: XP Thin Provisioning• CLPR: number of the CLPR to which the pool belongs
Optimize button	<p>If there is no pool in the storage system, this button optimizes the whole V-VOL management area. If pools exist in the storage system, this button optimizes the pool management block in the V-VOL management area. Optimization of the pool management block needs up to 20 minutes to complete.</p> <p>If you click this button, all the operations which are performed in the Pool window before then, but not yet applied to the storage system, will be canceled.</p>
SIM Complete Request check box	<p>Completes the SIMs related to pools. If you select the check box and click Apply, the SIMs that occur when the usage rate of a pool exceeds the threshold, or when a pool becomes blocked, will be completed.</p>
Apply button	<p>Applies the operations that have been performed in the Pool window to the storage system. If the specified operations complete successfully, the contents that have been displayed in the blue-italic fonts in the Pool tree or Pool-VOL list will be displayed in normal black fonts.</p> <p>If an error occurs during the operations, the error code and error message will be displayed in the error message box. For a complete list of XP Snapshot error codes, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i>.</p>
Cancel button	Cancels all the operations that are performed in the Pool window.

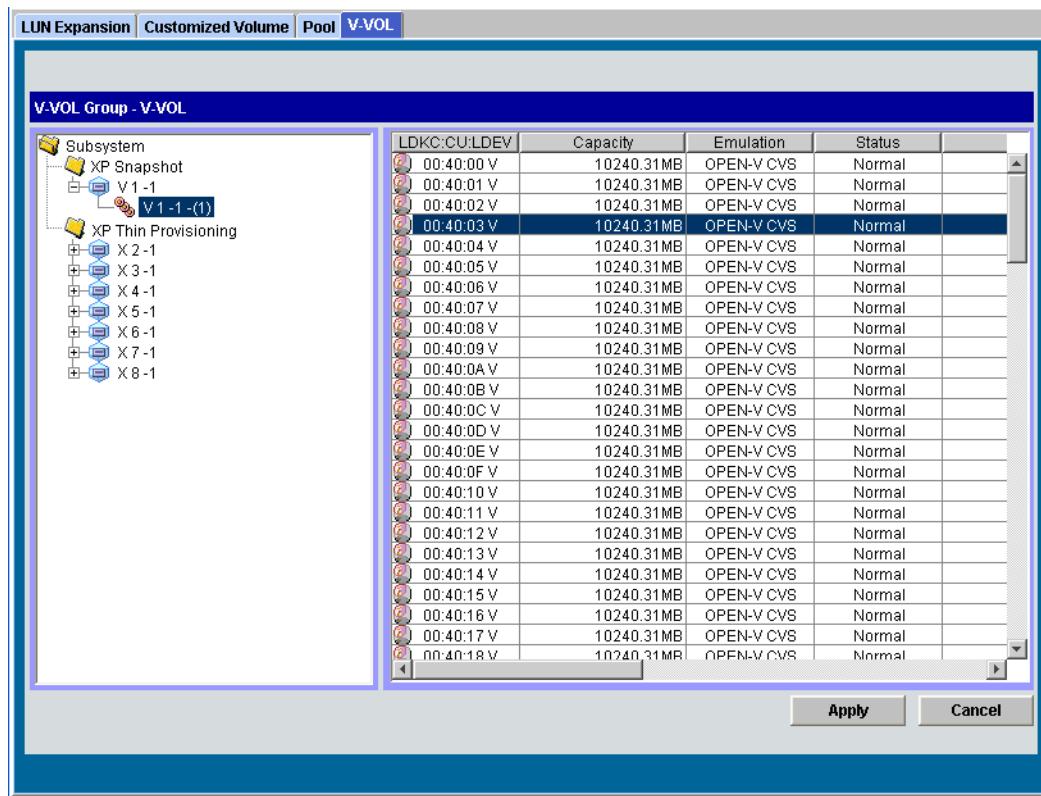
Table 28 Menus of the Pool Tree

Menu	Function
When you right-click the XP Snapshot icon:	New Pool Opens the New Pool dialog box ("New Pool Dialog Box" (page 71)). You can select this menu command only when you right-click the XP Snapshot icon.
	Delete Pool(s) Deletes multiple pools at the same time. You can select this menu command only when the pools that can be deleted exist.
	Restore Pool(s) Recovers multiple blocked pools to the normal status at the same time. You can select this menu command only when the blocked pools exist. However, note that you cannot select this command when the pool is blocked because its utilization ratio is 100% (that is, POOL FULL).
When you right-click the pool icon:	Change Pool Information Opens the Change Pool Information dialog box ("Change Pool Information Dialog Box" (page 72)).
	Delete Pool Deletes the pool.
	Restore Pool Recovers the blocked pool to the normal status. You can select this menu command only when you right-click the blocked pool icon. However, note that you cannot select this command when the pool is blocked because its utilization ratio is 100% (that is, POOL FULL).

V-VOL Window

The V-VOL window allows you to create and delete V-VOLs.

Figure 12 V-VOL Window



When you create V-VOLs in the **V-VOL** window, you create a V-VOL group and create the V-VOLs in the group. When you delete V-VOLs, you delete a V-VOL group, including all the V-VOLs in the group. To add V-VOLs to an existing V-VOL group, or to delete only certain V-VOLs from an existing

VVOL group, use the Virtual LVI/LUN function. To use the Virtual LVI/LUN function, you need a license for this function. For details about the Virtual LVI/LUN function, see the *HP StorageWorks XP24000/XP20000 Virtual LVI/LUN (VLL) and Volume Shredder User Guide*.

The V-VOL window displays the following items.

Table 29 V-VOL Window Items

Item	Description
VVOL Group – V-VOL tree (the area in the left portion of the window)	<p>The V-VOL groups in the disk storage system are displayed in the tree style. The following icons are displayed in the tree.</p> <ul style="list-style-type: none"> : The storage system or a program product : V-VOL group : V-VOL group (in the process of being deleted) : VDEV
Menu	<p>When you select the icons in the V-VOL group tree and right-click them, the menus in “Menus of the V-VOL Group Tree” (page 65) will be displayed.</p>
VVOL list (the area in the right of the window)	<p>Information about the V-VOLs that are registered in the VDEV selected in the V-VOL group tree. The following items are displayed in the list.</p> <ul style="list-style-type: none"> LDK:CU:LDEV: LDKC number, CU number, and LDEV number of the V-VOL V-VOLs available for XP Snapshot have the letter V after their LDEV numbers. V-VOLs which have the letter X after their LDEV numbers are to be used by XP Thin Provisioning, so you cannot use them for XP Snapshot S-VOLs. Free: indicates free space Capacity: capacity of the V-VOL Emulation: emulation type of the V-VOL If the emulation type is followed by the word CVS, the volume is a CV (custom-sized volume). For details about CV, see the <i>HP StorageWorks XP24000/XP20000 Virtual LVI/LUN (VLL) and Volume Shredder User Guide</i>. Status: status of the V-VOL <ul style="list-style-type: none"> Normal Blocked CLPR: number of the CLPR to which the V-VOL belongs Access Attribute: access attribute of the V-VOL Path: LU path of the V-VOL
Emulation button	<p>Changes the emulation type OPEN-0V of the virtual volume used by XP Thin Provisioning into OPEN-V. Also, the contents that have been displayed in blue-italic fonts in the V-VOL group tree or V-VOL list will be aborted.</p>

Table 29 V-VOL Window Items (continued)

Item	Description
Apply button	Applies the operations that have been performed in the V-VOL window to the storage system. If the specified operations are completed successfully, the contents that have been displayed in blue italic fonts in the V-VOL group tree or V-VOL list will be displayed in normal black fonts. If an error occurs during the operations, the error code and error message will be displayed in the error message box. For a complete list of XP Snapshot error codes, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console Error Codes</i> .
Cancel button	Cancels all the operations that are performed in the V-VOL window.

Table 30 Menus of the V-VOL Group Tree

Command	Function
New V-VOL Group	Opens the New V-VOL Group dialog box ("New V-VOL Group Dialog Box" (page 76)). You can select this command only when you right-click the icon of the program product. To create V-VOLs for XP Snapshot, right-click the XP Snapshot icon.
Delete V-VOL Group	Deletes the V-VOL group and the V-VOLs that are in that V-VOL group. You can select this command only when you right-click the V-VOL group icon.
Delete V-VOL Groups	Opens the Delete V-VOL Groups dialog box ("Delete V-VOL Groups Dialog Box" (page 84)). Deletes multiple V-VOL groups and the V-VOLs that are in those V-VOL groups at the same time. You can select this command when you right-click the XP Snapshot icon.

5 Performing XP Snapshot Operations

This chapter provides instructions for performing XP Snapshot operations.

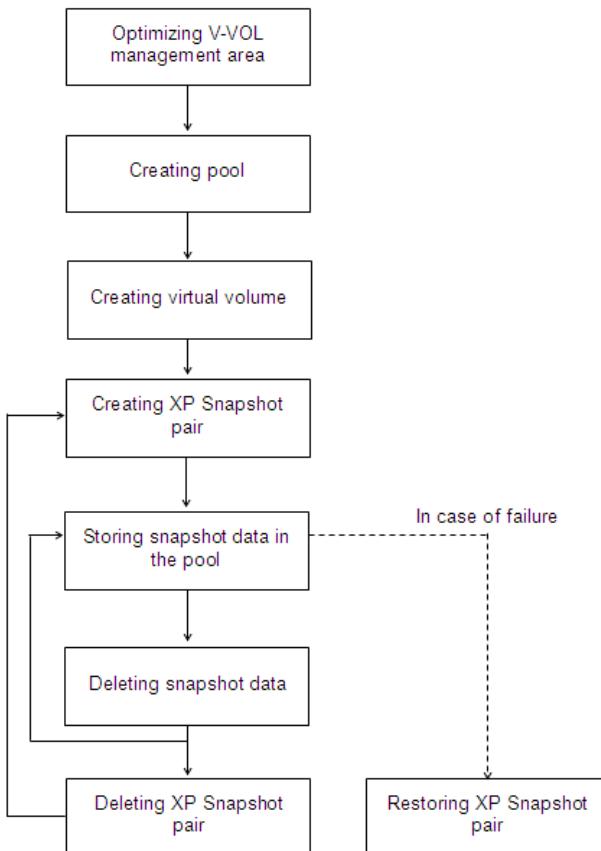
- “XP Snapshot Processes” (page 66)
- “Configuring the Volume List” (page 67)
- “Deleting the Settings in Preview List” (page 69)
- “Creating or Deleting Pools” (page 69)
- “Creating or Deleting Virtual Volumes” (page 74)
- “Creating XP Snapshot Pairs” (page 85)
- “Storing XP Snapshot Data” (page 85)
- “Storing XP Snapshot Data by Consistency Group with At-Time Snapshot Function” (page 86)
- “Restoring XP Snapshot Pairs” (page 88)
- “Deleting XP Snapshot Data” (page 88)
- “Deleting XP Snapshot Pairs” (page 89)
- “Viewing Detailed Volume and Pair Information” (page 91)
- “Viewing S-VOL Path Information” (page 93)
- “Viewing the Number of Pairs and License Information” (page 94)
- “Displaying the Operation History” (page 96)

When you want to check the result or progress of the operations, or when you want to display the latest information on the windows, click **File** and then **Refresh** on the menu bar of the Remote Web Console main window.

XP Snapshot Processes

“Using XP Snapshot” (page 67) shows the procedure for using XP Snapshot processes.

Figure 13 Using XP Snapshot



To create the pools and V-VOLs, you need to use Remote Web Console. To create XP Snapshot pairs and perform subsequent operations, you need to use the RAID Manager. When deleting pairs, you can also use Remote Web Console.

- Before creating a pool, it is required that the virtual volume management area is created in the shared memory. The virtual volume management area is automatically created when the additional shared memory is installed. For details on installing additional shared memory, call HP technical support.
- If any pools or XP Snapshot pairs are already created for testing purposes before you actually start using XP Snapshot for production purposes, HP recommends that you optimize the V-VOL management beforehand.

You do not always need to delete the XP Snapshot pairs after storing snapshot data in the pool. However, because one P-VOL can be paired with up to 64 S-VOLs, you need to delete the snapshot data or the pairs that are not necessary. When you delete an XP Snapshot pair, the snapshot data of the pair will also be deleted from the pool.

If a failure occurred and you restore an XP Snapshot pair, its snapshot data is written back to the P-VOL. You may not be able to restore the pair if another pair is being restored.

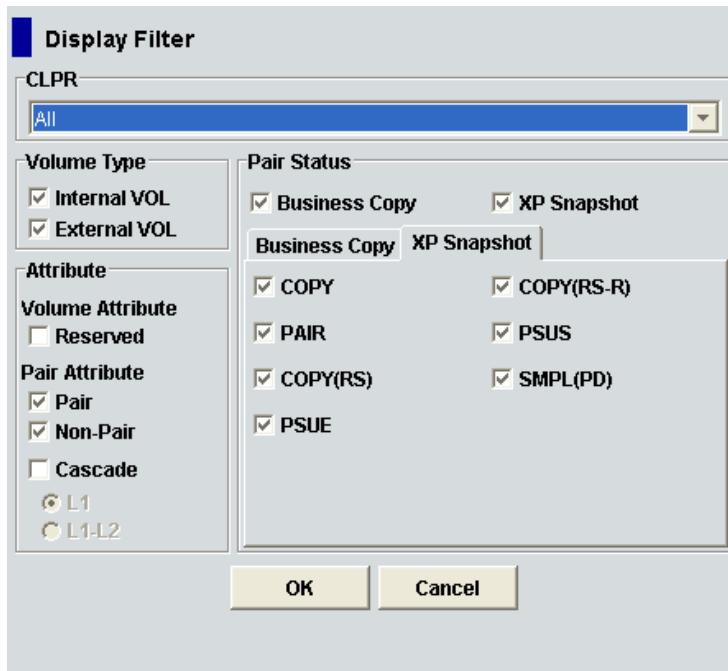
Configuring the Volume List

You can display only the specified volumes in the volume list if you specify the conditions in the Display Filter dialog box.

To display the Display Filter dialog box:

- Display XP Business Copy's Pair Operation window.
- Click **Display Filter**. The Display Filter dialog box will be displayed.

Figure 14 Display Filter Dialog Box (XP Snapshot Tab Selected)



- For details about the **XP Business Copy** tab of the Display Filter dialog box, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.
- The filter settings are only effective within the current operations in the XP Business Copy's Pair Operation window. If you start another program product or click a button on the toolbar on the Remote Web Console main window, the settings will be reset.

If you select the check boxes in the Display Filter dialog box, only the volumes that meet the condition(s) are allowed to be displayed in the volume list. If you deselect the check boxes, the volumes that meet the condition(s) will not be displayed in the volume list.

The Display Filter dialog box displays the following items.

- CLPR** drop-down list
Allows you to display the volumes in the specified cache logical partition (CLPR). If you select **All** from the drop-down list, the volumes in all the CLPRs will be displayed in the volume list.
- Volume Type** box
The following check boxes are displayed. Both check boxes are selected by default.
 - Internal VOL:** Displays or hides the internal volumes.
 - External VOL:** Displays or hides the external volumes.
- Attribute** box
The following check boxes are displayed.
 - Reserved:** This check box is for XP Business Copy pairs. For details, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.
 - Pair:** Displays or hides the volumes that form pair(s).
 - Non-Pair:** Displays or hides the volumes in SMPL status.
 - Cascade (L1 / L2 radio buttons):** This check box is for XP Business Copy pairs. For details, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

- **Pair Status** box
The following check boxes are displayed.
 - **XP Business Copy**: Displays or hides the XP Business Copy pairs.
 - **XP Snapshot**: Displays or hides the XP Snapshot pairs.
 If the check box is not selected, all the check boxes in each tab will be unavailable.
- **XP Business Copy** tab
This tab is for XP Business Copy pairs. For details, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.
- **XP Snapshot** tab
The check boxes that indicate the status of XP Snapshot pairs are displayed. If you select or deselect the check boxes, the XP Snapshot pairs in those statuses will be displayed or hidden in the volume list. To use the check boxes in the **XP Snapshot** tab, you must select the **XP Snapshot** check box in the **Pair Status** box.
- **OK** button
Applies the settings, and closes the Display Filter dialog box.
- **Cancel** button
Resets the settings, and closes the Display Filter dialog box.

Deleting the Settings in Preview List

The **Preview** list temporarily retains multiple operations of the same type. The settings in the **Preview** list will be reflected in the storage system when you click **Apply**. If the specified operations complete successfully, the **Preview** list will be cleared. If an error occurs during an operation, the failed operation will remain in the **Preview** list with an error icon () displayed on the left of the operation name.

The XP Snapshot settings in the **Preview** list can be deleted only before clicking **Apply**. The procedures for deleting the settings in the **Preview** list are as follows:

- To delete all of the settings in the **Preview** list, click **Cancel**.
- To delete only some of the settings in the **Preview** list:
 1. Select and right-click the setting which you want to delete. A menu will be displayed.
 2. Select the **Delete** command from the menu.

Only the selected setting will be deleted from the **Preview** list.

Creating or Deleting Pools

This section describes how to create new pools. Additionally, the procedures for changing the setting of pools or deleting pools are also described in this section.

Creating New Pools

The required time for creating pools depends on the number and the capacity of the pools and pool-VOLs which you add to the pool. If you create many pools, or if you add a pool-VOL of large capacity, it may take about 20 minutes until the processing ends.

To create a new pool:

1. Change the mode of the Remote Web Console to Modify.

If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

2. Right-click **XP Snapshot** in the **Pool** tree of the Pool window ("Pool Window" (page 56)). A menu is displayed.
3. Select **New Pool** from the menu. The New Pool dialog box ("New Pool Dialog Box" (page 71)) is displayed.

Enter the pool ID in the **Pool ID** text box.

You can enter only a whole number from 0 to 127 in this text box. Do not enter any number that is already used for another pool.

Select the threshold of the pool usage rate from the **Threshold** drop-down list.



CAUTION: If the usage rate of the pool exceeds the threshold, you cannot create new XP Snapshot pairs. Make sure you do not set too small a value for the threshold.

4. Check the contents of the setting and if there is no problem, click **Set**. The New Pool dialog box closes and the new pool will be displayed in the **Pool** tree.
5. Select the pool in the **Pool** tree.
6. Select the volumes which you want to register in the pool as the pool-VOLs from the **Free LDEVs** list.
 - If you select the CU number from the **CU** drop-down list, the volumes in the CU will be displayed in the list. Within the same CU, you can select multiple volumes at the same time.
 - If you select an LDKC from the **LDKC** drop-down list, only the CUs in the selected LDKC are displayed in the **CU** drop-down list.
 - See the notes in "Notes on Using External Volumes as Pool-VOLs" (page 41) when you select an external volume.

7. Click **Add Pool-VOL**.

The dialog box that lists the volumes you selected in Step 6 is displayed.

If you select and right-click the volume in the **Free LDEVs** list, a pop-up menu will be displayed.

If you select the **Add Pool-VOL** command from the pop-up menu, the result will be the same as when you click **Add Pool-VOL**.

8. Check the list of the volumes on the dialog box, and, if there is no problem, click **OK**. The dialog box closes and the selected volumes will be displayed in the **Pool-VOL** list.
9. To add more pool-VOLs, repeat Step 5 and the subsequent steps.
 - The total capacity of the pool-VOLs in the pool is the storage capacity of the pool. See "Notes on Defining Pool Capacity" (page 40) for notes on creating a pool.
 - The capacity of the pool management blocks in use will increase if you add the pool-VOLs. You need to be careful to keep the capacity of the pool management blocks in use to less than its total capacity.

10. To create another pool, repeat **Step 1** and the subsequent steps. Click **Apply**.

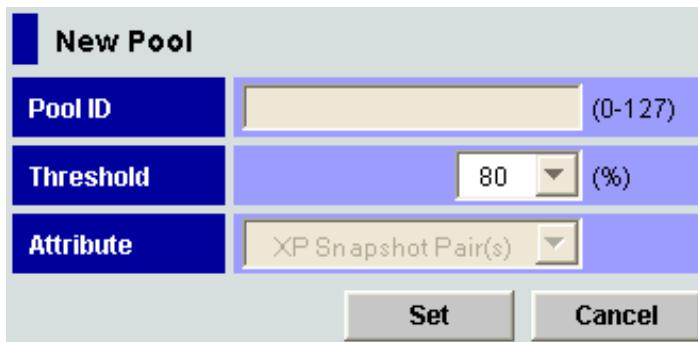
A confirmation message is displayed asking if it is OK to apply the setting to the storage system.

- △ **CAUTION:** You cannot delete the pool-VOLs after you add them. So, make sure that the settings of the pool-VOLs you are going to add are right.

11. Click **OK**.

The confirmation message closes and the new pool information is applied to the storage system.

Figure 15 New Pool Dialog Box



The New Pool dialog box displays the following items.

- **Pool ID** text box

You can enter the pool ID in the text box. A whole number from 0 to 127 can be entered in the text box.

Do not enter a pool ID that is already used by another pool. If you enter a pool ID that is already used by another pool and click **Set**, an error message will be displayed. In that case, enter a different number for the new pool ID.

- **Threshold** drop-down list

You can select the threshold of the pool usage rate between 20 and 95.

The unit of the threshold is percent (%). If the pool usage rate exceeds the threshold, the pool status changes to Warning. You cannot create new XP Snapshot pairs if the pool is in Warning status. Be careful not to set a very small value for the threshold.

- **Attribute** drop-down list

The program product that uses the pool is displayed. You cannot select the items from this drop-down list.

- **Set** button

Creates a new pool according to the settings in the New Pool dialog box and closes the dialog box.

- **Cancel** button

Cancels the settings in the New Pool dialog box and closes the dialog box. No pool will be created.

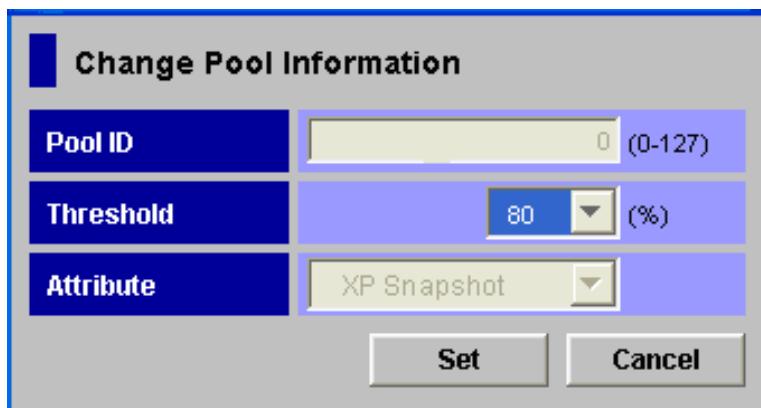
Changing the Information for the Pools

After you create a pool, the only setting you can change is the threshold.

To change the threshold of the pool:

1. Change the mode of the Remote Web Console to Modify.
If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
2. Select and right-click the pool whose setting you want to change in the **Pool** tree of the Pool window. A menu appears. If the pool usage rate is 95% or higher, the menu will not be displayed.
3. Select the **Change Pool Information** command from the menu. The **Change Pool Information** dialog box ([Figure 16 \(page 72\)](#)) appears.
4. Select the value for the threshold from the **Threshold** drop-down list.
In the drop-down list, only the values that are higher than the pool usage rate are displayed.
5. Click **OK**.
The **Change Pool Information** dialog box closes.
6. Click **Apply**.
The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
7. Click **OK**.
The confirmation message closes and the change of the setting is applied to the subsystem.

[Figure 16 Change Pool Information Dialog Box](#)



The items in the **Change Pool Information** dialog box are the same as those of the **New Pool** dialog box. However, in the **Change Pool Information** dialog box, you cannot enter or select items other than the **Threshold** drop-down list.

Deleting Pools

Usually, you specify one pool and delete only the specified pool. However, you may delete multiple pools at the same time, if necessary. This section describes the procedures for when you delete one specified pool and when you delete multiple pools at the same time.

Deleting a Pool

To delete a pool:

1. Change the mode of the Remote Web Console to Modify.
If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

2. Select and right-click the pool you want to delete in the **Pool** tree of the Pool window. A menu is displayed. If the amount of the pool capacity that is used is other than zero (0) GB, the menu will not be displayed.
3. Select the **Delete Pool** command from the menu. A confirmation message is displayed asking if it is OK to delete the selected pool.
4. Click **OK**. The icon of the selected pool changes to the icon which indicates the deleting process.
5. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
6. Click **OK**. The confirmation message closes, and the deletion of the pool is applied to the storage system.

Deleting Multiple Pools

- △ CAUTION:** If you execute the following operation, all the pools that can be deleted will be deleted. If there is any pool that you do not want to delete, you must delete one pool at a time by following the steps in "[Deleting a Pool](#)" (page 72).

To delete multiple pools:

1. Change the mode of the Remote Web Console to **Modify**.
If the mode is already changed to **Modify**, you can skip this step. For information about how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
2. Select and right-click the **XP Snapshot** icon in the **Pool** tree of the Pool window. A menu is displayed.
3. Select the **Delete Pool(s)** command from the menu. A confirmation message is displayed asking if it is OK to delete the pools.
4. Click **OK**. The icons of the pools change to indicate the pools that are being deleted.
5. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
6. Click **OK**. The confirmation message closes and the deletion of the pools is applied to the subsystem.

Optimizing the V-VOL Management Area or Pool Management Block

This section describes how to optimize the whole V-VOL management area or the pool management block in the V-VOL management area.

Optimizing the V-VOL Management Area

By optimizing the whole V-VOL management area, the V-VOL management area can be used much more efficiently. Therefore, you will be able to create a pool whose capacity is larger than before optimizing, or you will be able to create more pools compared to before the optimization.

You need to delete all pools in the storage system before optimizing the V-VOL management area. If pools exist in the storage system, only the pool management block will be optimized instead of the whole V-VOL management area.

To optimize the V-VOL management area:

1. Change the mode of the Remote Web Console to **Modify**.
If the mode is already changed to **Modify**, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

2. Click **Optimize** in the Pool window.

A confirmation message is displayed asking if it is OK to optimize the V-VOL management area or the pool management block.

3. Click **OK**.

A confirmation message is displayed asking if it is OK to cancel all the operations performed in the Pool window.

4. Click **OK**.

The confirmation message indicating if it is OK to apply the setting to the storage system and perform the initialization is displayed.

5. Click **OK**.

The optimization of the V-VOL management area or the pool management block is performed.

Optimizing the Pool Management Block

If you optimize the pool management block, I/O performance of the pool will improve compared to before optimization. You can optimize the pool management block without changing the pools already created in the storage system.

The procedure for optimizing the pool management block is the same as the procedure for optimizing the V-VOL management area. Therefore, follow the instructions in "["Optimizing the V-VOL Management Area" \(page 73\)](#)" to optimize the pool management block.

You may need up to 20 minutes to optimize the pool management block.

Creating or Deleting Virtual Volumes

This section describes how to create new V-VOLs. In addition, the procedures for deleting pools are also described in this section.

Creating New Virtual Volumes

To create new virtual volumes:

1. Change the mode of the Remote Web Console to Modify.

If the mode is already changed to Modify, you can skip this step. For information on changing the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

2. Right-click **XP Snapshot** in the V-VOL group tree of the V-VOL dialog box. A menu is displayed.

3. Select the **New V-VOL Group** command from the menu. The **New V-VOL Group** dialog box ("["New V-VOL Group Dialog Box" \(page 76\)](#)) is displayed.

4. Select or enter the V-VOL group ID in the **V-VOL Group** drop-down list.

You can enter only a whole number from 1 to 65536. Do not enter a number that is already used for another V-VOL group.

5. Select the emulation type of the V-VOL group from the **Emulation Type** drop-down list.

6. Select the CLPR number of the CLPR in which you want to register the V-VOL group from the **CLPR** drop-down list.

7. Enter the number of the V-VOL group in the **Copy of V-VOL Groups** text box.

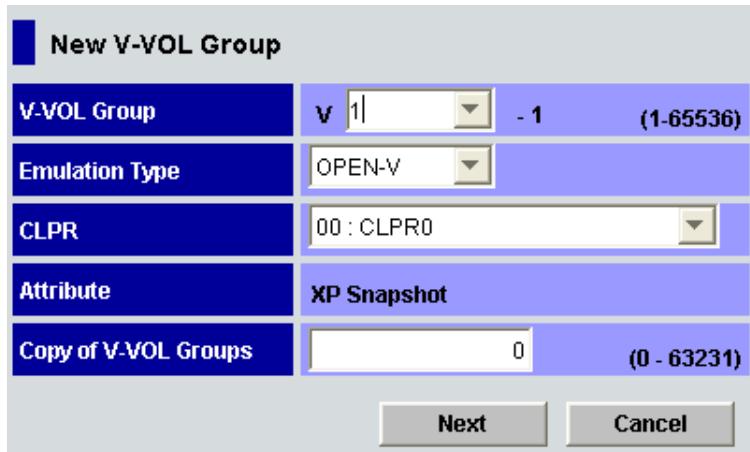
- You can enter only a whole number from 0 to 63231 in the **Copy of V-VOL Groups** text box. However, when the external volume groups of XP External Storage or the V-VOL groups of XP Thin Provisioning are created, the available V-VOL groups for XP Snapshot will be fewer than the maximum number according to the number of the external volume groups and V-VOL groups of XP Thin Provisioning. For example, if 10 external volume

groups are created for XP External Storage, you can enter only a whole number under 63221.

- If you create multiple V-VOL groups at the same time, all V-VOLs that are going to be registered in each V-VOL group will have the same emulation type and capacity.
8. Click **Next**. The Create V-VOL wizard dialog box (1) ("Create V-VOL Wizard Dialog Box (1)" (page 77)) is displayed.
 9. Select the emulation type of the V-VOL from the **Emulation Type** drop-down list.
 10. Select the unit of the capacity of the V-VOL from the **Capacity Unit** drop-down list. The selected unit is displayed after the **Capacity** text box.
 11. Enter the capacity of the V-VOL in the **Capacity** text box.
 - If the unit is megabytes (MB), you can enter only a whole number from 46 to 4194303. If the unit is blocks, enter a whole number from 96000 to 8589934592. If the unit is cylinders, enter a whole number from 50 to 4473924.
 - The V-VOLs you are creating will be used when you specify the S-VOLs of the XP Snapshot pairs. Because the capacity of the P-VOL and the S-VOL of the XP Snapshot pair must be equal, consider the capacity of the P-VOLs when you decide the V-VOL capacity.
 - When you specify the **Capacity Unit** as MB or Cyl, the storage system adjusts the capacity to an optimal value. Therefore, when you want to set the capacity accurately to the largest possible V-VOL capacity, specify the **Capacity Unit** as block.
 12. Enter the number of the V-VOLs you want to create in the **Number of V-VOL** text box.
You can enter only a whole number from 1 to 1024 in this text box.
 13. Click **Set**. The volumes are added to the V-VOL information setting list (middle of the dialog box). To create more V-VOLs, repeat Step 8 through Step 13.
By using XP Snapshot, you cannot add new V-VOLs to the V-VOL group when you complete the operations to create the V-VOLs. Make sure to add enough V-VOLs to create the XP Snapshot pairs at this point.
 14. Click **Next**. The Create V-VOL wizard dialog box (2) ("Create V-VOL Wizard Dialog Box (2)" (page 79)) is displayed.
 15. Select the volume in the V-VOL information setting list (upper right area of the dialog box).
 16. Select the LDKC number from the **Select LDKC No.** drop-down list, and select the CU number from the **Select CU No.** drop-down list. Areas of the CU selected from the drop-down list are displayed in the **Select LDEV No.** area (middle of the dialog box).
 - Only the areas displayed by the white cells are available for the V-VOLs. You cannot use the areas displayed by the gray cells to create the V-VOLs.
 - To select the CUs that belong to other SLPRs, select the **CU number of another SLPR is used** check box.
 17. Select the interval between the LDEV numbers from the **Interval** drop-down list.
If you select **0**, the LDEV number will be sequential.
 18. Select the area in the **Select LDEV No.** area. The color of the selected area changes to blue. The CU number and LDEV number are added to the V-VOL information setting list, and the blue italic fonts change to black normal fonts. If there are multiple V-VOLs to set, repeat Step 14 through Step 18.
 19. Click **Next**. The Create V-VOL wizard dialog box (3) ("Create V-VOL Wizard Dialog Box (4)" (page 82)) is displayed.
 20. Check the settings and, if there is no problem, click **OK**. The Create V-VOL wizard dialog box (3) closes and the V-VOL window is displayed again. In the V-VOL window, the settings are displayed in the blue italic fonts.

21. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
22. Click **OK**. The confirmation message closes and the new V-VOL information is applied to the subsystem.

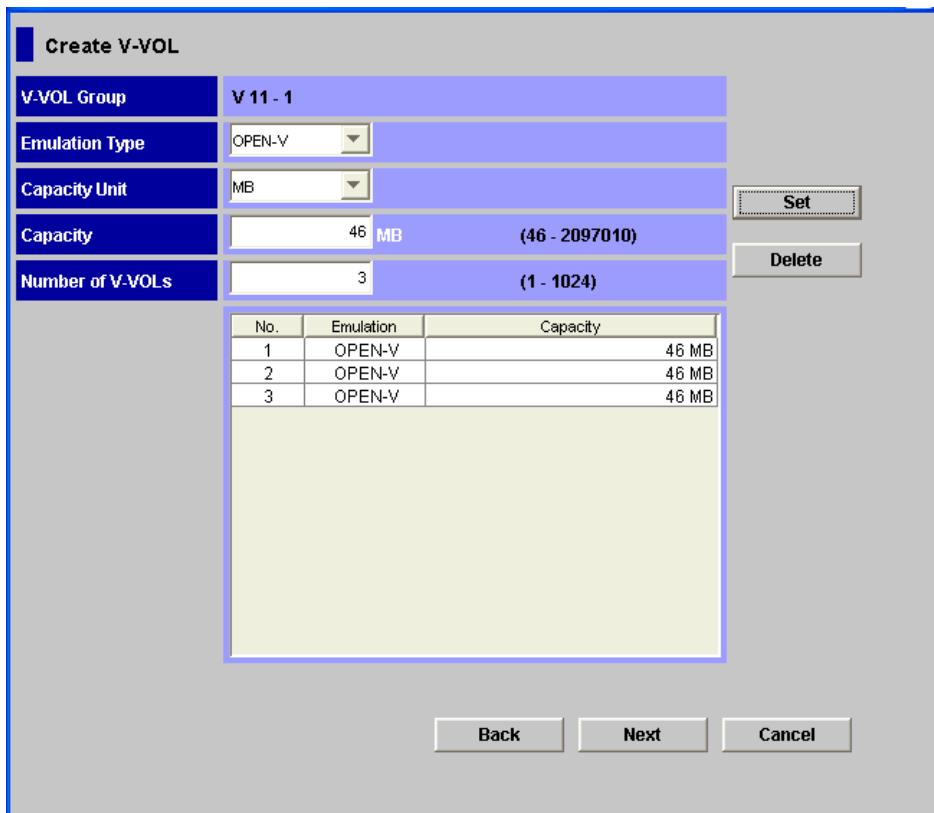
Figure 17 New V-VOL Group Dialog Box



The New V-VOL Group dialog box displays the following items.

- **V-VOL Group** drop-down list
You can select or enter the V-VOL group ID in the drop-down list. A whole number from 1 to 65536 can be selected or entered in the drop-down list.
Do not enter a V-VOL group ID that is already used by another V-VOL group. If you enter a V-VOL group ID that is already used by another V-VOL group and click **Next**, an error message will be displayed. In that case, select or enter a different number for the new V-VOL group ID.
- **Emulation Type** drop-down list
You can select the emulation type of the V-VOL group.
- **CLPR** drop-down list
You can select the CLPR of the V-VOL group.
- **Attribute**
The name of the program product that is going to use the V-VOL group is displayed. This is the name of the program product whose icon you right-clicked in order to display the New V-VOL Group dialog box.
- **Copy of V-VOL Groups** text box
The number of the V-VOL groups to be copied can be entered. You can enter a whole number from 0 to 63231. Note that no V-VOL group will be copied if you enter 0.
- **Next** button
Fixes the settings in the New V-VOL Group dialog box and displays the Create V-VOL wizard dialog box (1).
- **Cancel** button
Cancels the settings in the New V-VOL Group dialog box and closes the dialog box.

Figure 18 Create V-VOL Wizard Dialog Box (1)



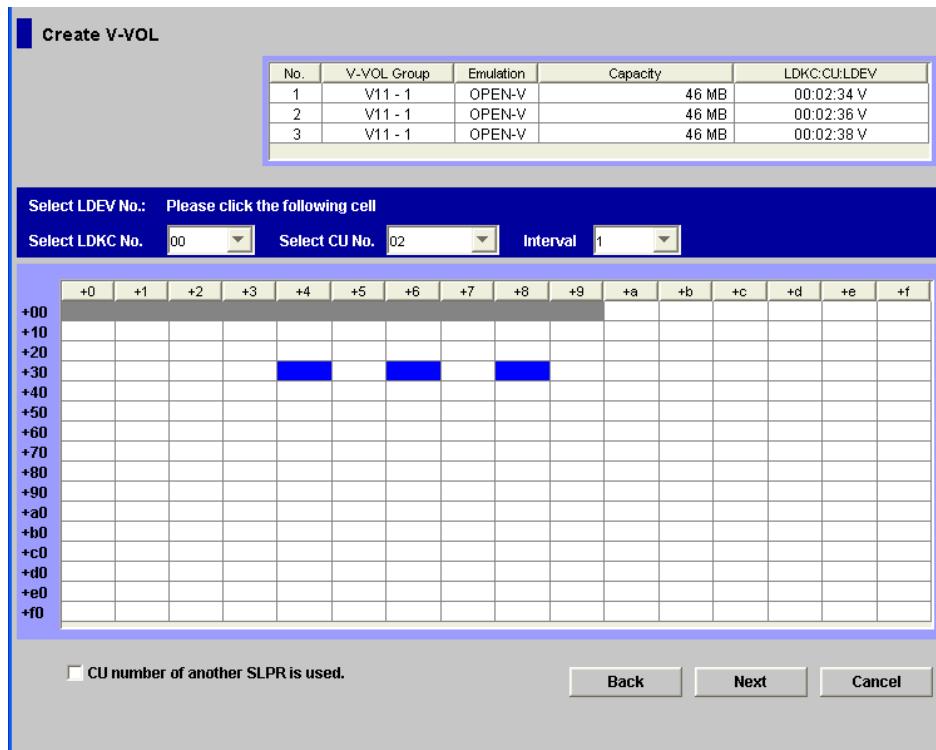
The Create V-VOL wizard dialog box (1) displays the following items.

- **V-VOL Group**
V-VOL group ID that you set in the New V-VOL Group dialog box is displayed.
- **Emulation Type** drop-down list
You can select the emulation type of the V-VOL.
- **Capacity Unit** drop-down list
You can select the unit of the capacity of the V-VOL: **MB** (megabyte), **block**, or **Cyl**.
- **Capacity** text box
You can enter the capacity of the V-VOL in the text box. If you selected **MB** from the **Capacity Unit** drop-down list, you can enter a whole number from 46 to 4194303. If you selected **block** from the drop-down list, you can enter a whole number from 96000 to 8589934592. If you selected **Cyl** from the **Capacity Unit** drop-down list, you can enter a whole number from 50 to 4473924.
When you specify the **Capacity Unit** as MB or Cyl, the storage system adjusts the capacity to an optimal value. Therefore when you want to set the capacity accurately to the largest possible V-VOL capacity, specify the **Capacity Unit** as block
- **Number of V-VOL** text box
You can enter the number of the V-VOLs that you want to add in the text box. Enter a whole number from 1 to 1024.
The number of V-VOLs that you can enter changes by the number of V-VOL groups to be copied and set in the New V-VOL Group dialog box ("New V-VOL Group Dialog Box" (page 76)). For example, when the number of available V-VOLs is 1024, and you enter 100 in the **Copy of V-VOL Groups** text box in the New V-VOL Group dialog box, you can specify up to 10

V-VOLs per V-VOL group. In this case, (1 - 10) is displayed on the right of the **Number of V-VOL** text box.

- **Set** button
Adds the V-VOL(s) to the V-VOL information setting list.
- **Delete** button
Deletes the selected V-VOL(s) from the V-VOL information setting list.
- V-VOL information setting list (for example, middle of the dialog box)
Information about the V-VOL(s) that you are going to create is displayed.
 - **No.:** number
 - **Emulation:** emulation type of the V-VOL
 - **Capacity:** capacity of the V-VOL
- **Back** button
Returns to the New V-VOL Group dialog box while maintaining the settings in this dialog box.
- **Next** button
Confirms the setting in this dialog box and moves to the Create V-VOL wizard dialog box (2).
- **Cancel** button
Cancels the setting in the Create V-VOL wizard dialog box (1) and closes the dialog box.

Figure 19 Create V-VOL Wizard Dialog Box (2)



The Create V-VOL wizard dialog box (2) displays the following items.

- V-VOL information setting list (upper right area of the dialog box)
Information about the V-VOL(s) that you are going to create is displayed.
 - **No.:** number
 - **V-VOL Group:** V-VOL group ID
 - **Emulation:** emulation type of the V-VOL
 - **Capacity:** capacity of the V-VOL
 - **LDKC:CU:LDEV:** LDKC number, CU number, and LDEV number of the V-VOL
- **Select LDKC No.** drop-down list
You can select the LDKC number.
- **Select CU No.** drop-down list
You can select the CU number.
- **Interval** drop-down list
You can select the interval between the LDEV numbers that need to be assigned to the newly created V-VOLs. If you select **0**, the LDEV numbers will be sequential.
 - The value you specify as the interval between LDEV numbers counts only the available LDEV numbers and skips those that are not selectable.
 - Even when you use the multiple CUs, LDEV numbers will be assigned according to the setting in the **Interval** drop-down list.
- **Select LDEV No.** area
Among the CUs which belong to the LDKC you selected in the **Select LDKC No.** drop-down list, the settings of LDEV numbers for the CU number selected from the **Select CU No.** drop-down

list are displayed. Numbers in the upper end and the left side indicate the LDEV number. For example, the LDEV number of the cell whose upper end is **+2** and left side is **+10** is 12.

Gray cells indicate the LDEV numbers that are already used for other volumes, white cells indicate the unused LDEV numbers, and blue cells indicate the LDEV numbers that are selected for the V-VOLs in this dialog box.

- **CU number of another SLPR is used** check box

Allows you to select the CU numbers of the SLPR other than the SLPR now you are in.

- **Back** button

Returns to the Create V-VOL wizard dialog box (1) while maintaining the settings in this dialog box.

- **Next** button

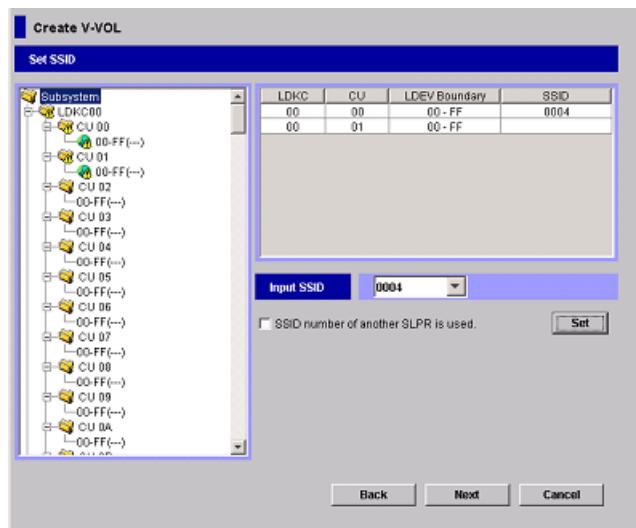
Fixes the setting in this dialog box and moves to the Create V-VOL wizard dialog box (3).

The Create V-VOL dialog box (3) appears only when SSID is not assigned to the boundary area that contains LDEV numbers you set in this dialog box. The Create V-VOL dialog box (4) appears when SSID is assigned.

- **Cancel** button

Cancels the setting in the Create V-VOL wizard dialog box (2) and closes the dialog box.

Figure 20 Create V-VOL Wizard Dialog Box (3)



- **SSID tree**

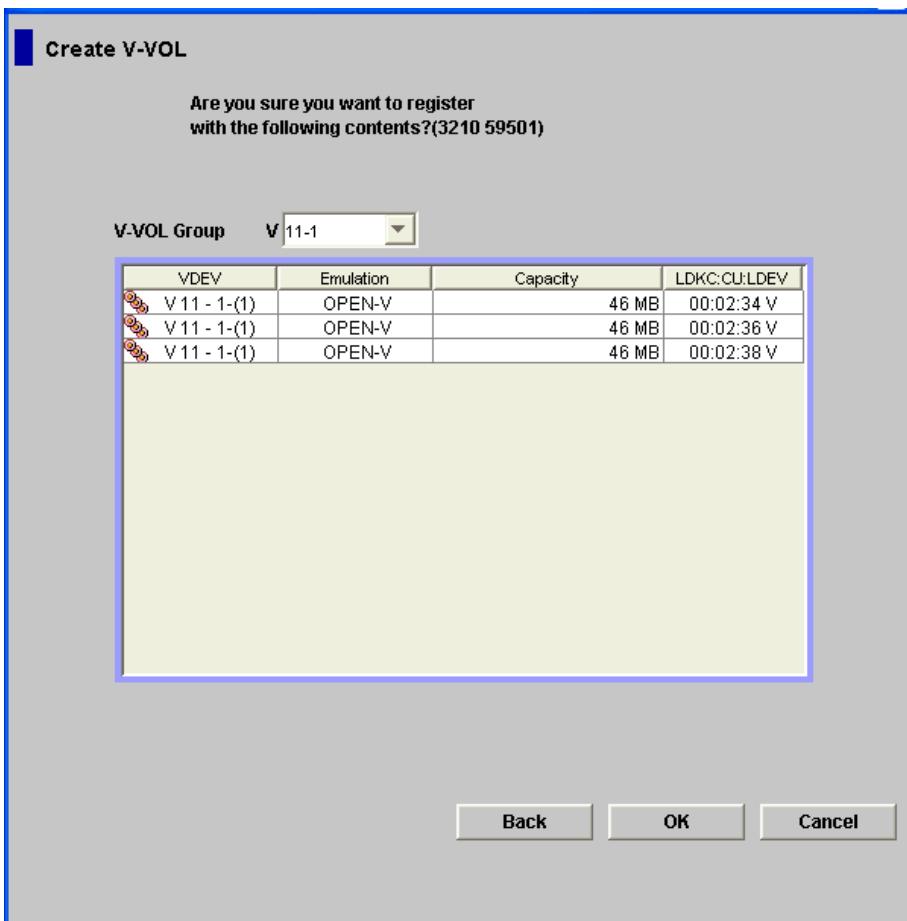
Shows the LDKC numbers, CU numbers, SSID boundary and SSID in a hierarchical tree structure.

The boundary area is a collection of LDEV numbers to which the SSID is assigned. For example, using the boundary area 00-FF, assign an SSID between LDEV numbers 00 to FF. A CU contains one or four boundary areas, which are fixed for each CU with factory settings.

An SSID in parentheses is shown at the right of the boundary area (left column on screen). When an SSID is not assigned to the boundary area, an exclamation mark is added to the LDKC number, CU number or boundary area icon, and an "---" appears to the right of the boundary area.

-  : LDKC number or CU number. Indicates that SSID is assigned to the all boundary areas.
 -  : LDKC number or CU number. Indicates the boundary area with no SSID.
 -  : Indicates that no SSID is assigned to the boundary area.
- **Set SSID list**
 Assigns SSID to the boundary area that contains LDEV numbers you set in this dialog box.
 Information about the Set SSID list:
 - LDKC: LDKC number of CU number where SSID is not assigned.
 - CU: CU number where SSID is not assigned.
 - LDEV boundary: Boundary area of LDEV number where SSID is not assigned.
 - SSID: Assigned SSID. The initial value is blank.
- **Input SSID list**
 Select or enter the SSID you want. You must be logged in as storage administrator to enter an SSID.
- **Set**
 - **Input SSID:** Sets the SSID you select or input from the Input SSID list.
 - **Set SSID:** Updates the SSID you select or input from the Input SSID list.
- **SSID number of another SLPR is used**
 When the SSID number of another SLPR is used check box is checked, you can enter the SSID except for an SLPR that contains a parity group of your operation in the Input SSID list. When the check box is not checked, you can only select the SSID of the SLPR that contains a parity group of your operation.
SSID number of another SLPR is used appears only when you are logged in as a storage administrator and more than two SLPRs exist. When the check box is not checked, **Input SSID** is not accessible.
- **Back**
 Maintains the settings in this dialog box while returning you to the Create V-VOL dialog box (2).
- **Next**
 Implements the settings in this dialog box and opens the Create V-VOL dialog box (4).
- **Cancel**
 Cancels the operation and closes the dialog box.

Figure 21 Create V-VOL Wizard Dialog Box (4)



The Create V-VOL wizard dialog box (4) displays the following items.

- **V-VOL Group** drop-down list
You can select the V-VOL group number of the V-VOL you set. Note that you cannot enter the number.
- V-VOL information setting list (middle of the dialog box)
Information about the V-VOL(s) whose V-VOL number you selected from the **V-VOL Group** drop-down list is displayed.
 - **VDEV:** V-VOL group number and VDEV number
 - **Emulation:** emulation type of the V-VOL
 - **Capacity:** capacity of the V-VOL
 - **LDKC:CU:LDEV:** LDKC number, CU number, and LDEV number of the V-VOL
- **Back** button
Returns to the Create V-VOL wizard dialog box (2) while maintaining the settings in this dialog box.
- **OK** button
Fixes the setting in the Create V-VOL wizard dialog box (3) and closes the dialog box.
- **Cancel** button
Cancels the setting in the Create V-VOL wizard dialog box (3) and closes the dialog box.

Deleting Virtual Volumes and a Virtual Volume Group

To delete V-VOL(s) and a V-VOL group:

1. Change the mode of the Remote Web Console to Modify. If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
2. In the V-VOL group tree in the V-VOL window, select and right-click the V-VOL group which contains the V-VOL(s) you want to delete. A menu is displayed.
3. Select the Delete V-VOL Group command from the menu. A confirmation message is displayed asking if it is OK to delete the selected V-VOL group.
4. Click **OK**. The icon of the selected V-VOL group changes to the icon which indicates the deleting process.
5. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
6. Click **OK**. The confirmation message closes and the deletion of the V-VOL group is applied to the subsystem.

△ **CAUTION:** You cannot delete the V-VOL and its V-VOL group if the V-VOL is used as the S-VOL of the XP Snapshot pair. To delete the V-VOL that is used as the S-VOL and its V-VOL group, first you need to delete that pair.

Deleting Multiple Virtual Volume Groups

To delete V-VOL(s) and multiple V-VOL groups:

△ **CAUTION:** You cannot delete the V-VOLs and their V-VOL groups if the V-VOLs are used as the S-VOLs of the XP Snapshot pairs. To delete the V-VOLs that are used as the S-VOLs and their V-VOL groups, first you need to delete XP Snapshot pairs.

To delete V-VOLs and V-VOL groups:

1. Change the mode of the Remote Web Console to Modify. If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
2. Right-click the XP Snapshot in the V-VOL group tree of the V-VOL window. A menu is displayed.
3. Select the Delete V-VOL Groups command from the menu. The Delete V-VOL Groups dialog box ("Delete V-VOL Groups Dialog Box" (page 84)) is displayed.

Depending on your environment, it may take approximately 30 seconds to open the Delete V-VOL Groups dialog box.

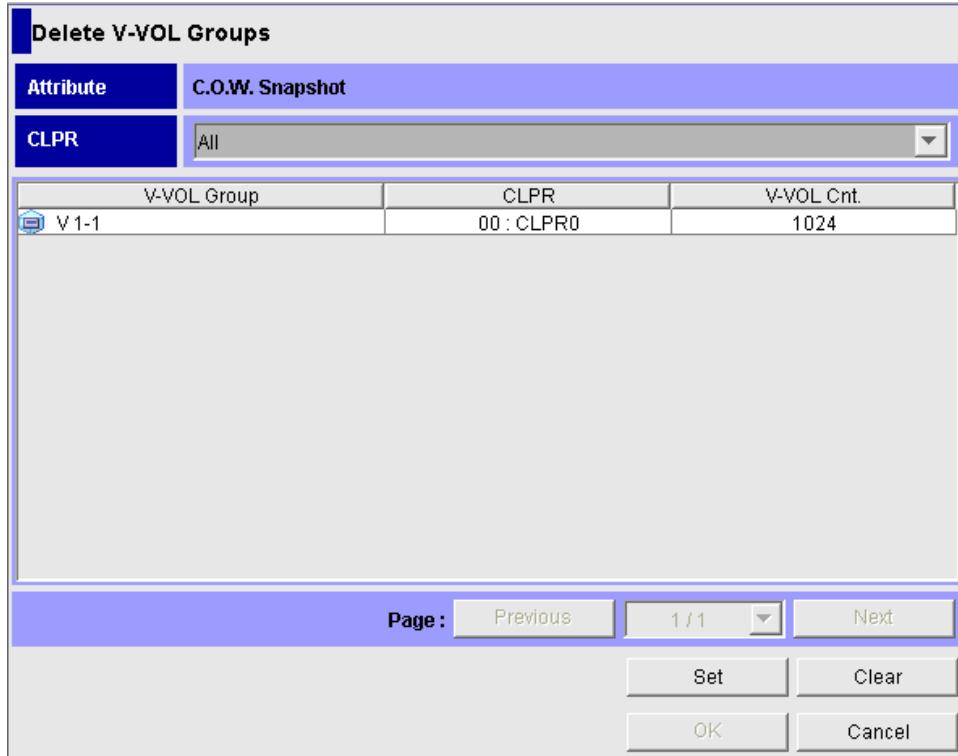
4. In the V-VOL group's information setting list in the Delete V-VOL Groups dialog box, select the V-VOL groups you want to delete. Specify a relevant CLPR from the CLPR drop-down list, and the list of V-VOL groups that are included in the CLPR is displayed in the V-VOL group's information setting list. To locate the V-VOL groups you want to delete, click the button in the page area under the list and display the page which includes the V-VOL groups that you want to delete.

The list displays a maximum of 4,096 V-VOL groups at a time. If the number of V-VOL groups exceeds 4,096, the **Previous** and **Next** buttons allow you to display the remaining V-VOL groups.

5. Click **Set**. The specified V-VOL groups are displayed in blue italic font. Click the **Clear** button to clear the specified V-VOL groups. To specify more V-VOL groups, repeat step 4 to step 5.

6. Click **OK**. The Delete V-VOL Groups dialog box closes. A confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
7. Click **OK**. The confirmation message closes and the deletion of the V-VOL groups is applied to the subsystem. If you click the **Cancel** button in this message, the Delete V-VOL Groups dialog box is displayed again. If the specified V-VOL groups are not deleted, a dialog box is displayed.

Figure 22 Delete V-VOL Groups Dialog Box



The Delete V-VOL Groups dialog box displays the following items.

- **Attribute**
The name of the program product that is going to use the V-VOL groups is displayed. This is the name of the program product whose icon you right-clicked to display the Delete V-VOL Groups dialog box.
- **CLPR drop-down list**
You can select the CLPR of the V-VOL group. If **All** is selected, all V-VOL groups in all CLPRs are displayed.
- **V-VOL information setting list** (for example, the central portion of the dialog box)
Information about the V-VOL groups that you are going to delete is displayed.
 - **V-VOL Group:** V-VOL group ID
 - **CLPR:** the number of the CLPR
 - **V-VOL Cnt:** the number of the V-VOLs in the V-VOL groups

- Icons

The following icons are displayed in the dialog box.

 -  V-VOL group
 -  V-VOL group (in the process of being deleted)
- The Page area displays the number of the current page and the following items are used to change pages of the list.
 - **Previous** button allows you to display the previous 4,096 V-VOL groups.
 - **N/M** drop-down list: The **N** displays the number of the current page. The **M** displays total number of pages. You can click the drop-down list, and choose the number of the page you want to display.
 - **Next** button allows you to display the next 4,096 V-VOL groups.
- **Set** button specifies that the V-VOL groups selected in the V-VOL information setting list will be deleted. The V-VOL groups to be deleted are displayed as blue-italic fonts.
- **Clear** button clears each setting in the V-VOL information setting list.
- **OK** button closes the Delete V-VOL Groups dialog box. A confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
- **Cancel** button cancels all the settings in the Delete V-VOL Groups dialog box.

Creating XP Snapshot Pairs

Use the `paircreate` command of the RAID Manager to create XP Snapshot pairs. To create XP Snapshot pairs, the following are required.

- Specify a volume that meets the requirements in “[P-VOL Requirements](#)” (page 33) as a P-VOL
- Specify a volume that meets the requirements in “[S-VOL Requirements](#)” (page 34) as an S-VOL
- Specify the same size volumes as a P-VOL and S-VOL
- When you use a volume that is already used as the P-VOL of another pair for the P-VOL of the new pair, specify the same pool for the pairs which share the P-VOL

For details about the `paircreate` command, see the *HP StorageWorks XP RAID Manager User Guide*.

Storing XP Snapshot Data

Use the `pairsplit` command of the RAID Manager to store snapshot data in the pool. You can store 64 snapshot data at most per P-VOL. To store snapshot data, the pair status must be PAIR.

When a P-VOL is paired with two or more volumes, make sure that none of the pairs is in COPY(RS-R) status. If some pairs are in the COPY(RS-R) status, the `pairsplit` command may end abnormally.

During execution of the `pairsplit` command to the XP Snapshot pair, do not execute the `pairresync -restore` command to the other XP Snapshot pair that shares P-VOL with the corresponding pair. The `pairsplit` command being executed may end abnormally. Possible causes are as follows:

- Command rejection
- Timeout (Error code: EX_EWSTOT)
- Suspending the pair (Error code: EX_EWSUSE)

You can store one snapshot data at a time by using the `pairsplit` command, but you cannot specify the snapshot data ID. For details about the `pairsplit` command, see the *HP StorageWorks XP RAID Manager User Guide*.

XP Snapshot does not support Quick Split mode. If you specify Quick Split mode, snapshot data will not be stored in the pool, even if the command ends normally. Therefore, even if you specify Quick Split mode, Quick Split mode does not take effect.

Storing XP Snapshot Data by Consistency Group with At-Time Snapshot Function

With RAID Manager, you can store snapshot data by a consistency group (At-Time Snapshot function).

Consistency groups have the following restrictions:

Table 31 Specifications of Consistency Group

Items	Descriptions
Consistency group number	A number is assigned to each consistency group within a range of 0 to 255. You can specify a consistency group number when you create XP Snapshot pairs. If you do not specify a number, an unused number is assigned automatically. Use the Volume List of the XP Snapshot window or Pair Operation window of XP Business Copy Software to view the list of the consistency group numbers. You can configure up to 256 consistency groups in a storage system, including XP Business Copy consistency groups and Hitachi ShadowImage for Mainframe consistency groups.
Number of pairs	You can define up to 8,192 XP Snapshot pairs in a consistency group. XP Business Copy Software pairs, Hitachi ShadowImage™ for Mainframe, and XP Snapshot pairs cannot coexist in the same consistency group.

A summary of the steps to store snapshot data using the At-Time Snapshot function of RAID Manager is listed below. For details about the steps, see the *HP StorageWorks XP RAID Manager User Guide*.

1. Execute the `paircreate` command with specifying the consistency group number.
The XP Snapshot pair that is the target of the At-Time Snapshot function is created.
The XP Snapshot function is enabled automatically by specifying the consistency group number.
2. Execute the `paircreate` command again by specifying the same consistency group number specified in step 1.
You can add pairs into the same consistency group. Repeat this step for each number of pairs that you want to specify into the same consistency group.
3. Execute the `pairsplit` command to the consistency group that is a target of the At-Time Snapshot function.
After the XP24000/XP20000 Disk Array accepts the `pairsplit` command, the snapshot data of the P-VOL will be stored at the time when the host issues an I/O request to each P-VOL in the corresponding consistency group.

Consistency group:

- You cannot specify the XP Snapshot pairs in the same consistency group if the pairs share the same volume as P-VOL. If you specify these pairs in the same consistency group, the paircreate command will be rejected.
- You should not mix pairs created with the At-Time Snapshot option and without the At-Time Snapshot option in the same group as the group which is defined in the RAID Manager configuration file. This group differs from the consistency group. If you mix these two types of pairs, the pairsplit command may terminate abnormally. Additionally, it is not recommended that the stored snapshot data is the P-VOL data at the time when the XP 24000/20000 Disk Array accepts the pairsplit command.
- You can specify only 1 consistency group for each group that is defined in the RAID Manager configuration file.

When you create a pair by using the group that is defined in the RAID Manager configuration file, if some pairs specifying consistency group has been created in the group already, you should create a pair by specifying the same consistency group as the corresponding pairs. Even if you try to create a pair by specifying the other consistency group, the pair will be added to the same consistency group as the corresponding pairs.

If you want to specify plural consistency groups, define as many groups as the consistency groups that you want to specify in the RAID Manager configuration file.

- **Cautions for storing snapshot data:**

When the pairsplit command is issued, if the corresponding consistency group includes the pairs that are not in the PAIR status, the pairsplit command processing may terminate abnormally.

The causes of abnormal end are as follows:

- Command rejection
- Timeout (Error code: EX_EWSTOT)
- Suspending the pair (Error code: EX_EWSUSE)

While executing the pairsplit command, if the other operation (deletion of snapshot data or deletion of XP Snapshot pairs, etc.) is executed to the pairs in the corresponding consistency group, the consistency of the stored snapshot data cannot be ensured.

Therefore, the pairsplit command processing may terminate abnormally.

The causes of abnormal end are as follows:

- Command rejection
- Timeout (Error code: EX_EWSTOT)
- Suspending the pair (Error code: EX_EWSUSE)

The restoration of the XP Snapshot pair sometimes ends abnormally for any of the following reasons:

- The snapshot data of the XP Snapshot pair for restoration is being stored per consistency group.
- The P-VOL of the XP Snapshot pair for restoration is used as the P-VOL of another XP Snapshot pair, and the snapshot data of the latter XP Snapshot pair is being stored per consistency group.

- **Caution for when the host server is down or has failed:**

When the host server is down or has failed, a consistency group without any XP Snapshot pairs may be created. If you create pairs that are the target of the At-Time Split option from XP RAID Manager under such a condition, the command might be rejected. In this

case, find the consistency group number by sorting the CTG column on the XP Snapshot window or Pair Operation window of XP Business Copy, and create a pair specifying the consistency group number intentionally.

- **Caution for when the XP Snapshot pair P-VOL is shared with an XP Continuous Access Software pair or an XP Continuous Access Journal Software pair:**

If the status of some XP Snapshot pairs belonging to a consistency group cannot be changed, the `pairsplit` command processing by RAID Manager might terminate abnormally with the error code EX_EWSTOT. This error indicates that a timeout has occurred. Probable reasons why the pair status cannot be changed are as follows:

- When an XP Continuous Access Journal S-VOL is used as an XP Snapshot P-VOL, the capacity of the journal volumes for this XP Continuous Access Journal pair is insufficient.
- The XP Snapshot license is invalid.
- Volumes of the XP Snapshot pair are blocked.
- The XP Snapshot pair is in the status where the `pairsplit` command cannot be executed. See “[Pair Statuses and the Results of the RAID Manager Commands](#)” (page 16).
- The XP Continuous Access pair or XP Continuous Access Journal pair is in the status where the `pairsplit` command cannot be executed. See “[Interoperability with Other Products and Functions](#)” (page 26).

After these factors are removed, resynchronize a pair, and execute the `pairsplit` command again.

Restoring XP Snapshot Pairs

Use the `pairresync -restore` command of the RAID Manager to restore XP Snapshot pairs. The XP Snapshot pair must be in PSUS status when you restore the pair.

When the restoration completes, the pair status changes to PAIR. For details about the `pairresync -restore` command, see the *HP StorageWorks XP RAID Manager User Guide*.



CAUTION: If a failure occurs during the restoration, the pair status changes to PSUE. To recover the PSUE pair, you need to delete the snapshot data of the pair. When you recover the PSUE pair by deleting its snapshot data, data in the P-VOL will not be ensured. Therefore, you need to overwrite the P-VOL with the backup data or format the P-VOL.

XP Snapshot does not support Quick Restore mode. If you specify Quick Restore mode, XP Snapshot pair will not be restored even if the command ends normally. Therefore, even if you specify Quick Resync mode, Quick Resync mode does not take effect.

Deleting XP Snapshot Data

Use the `pairresync` command of the RAID Manager to delete snapshot data. You can store up to 64 snapshot data per P-VOL. Therefore, to store the new snapshot data in a P-VOL that already has 64 snapshot data, you need to delete the old snapshot data.

If you delete snapshot data, free area in the pool will increase. To increase the free area in the pool, delete snapshot data by issuing the `pairresync` command on the XP Snapshot pairs in PSUS status. However, if the snapshot data you try to delete shares a data area with other snapshot data, only the snapshot ID will be deleted and the data itself will not be deleted from the pool.

For details about the `pairresync` command, see the *HP StorageWorks XP RAID Manager User Guide*.

XP Snapshot does not support Quick Resync mode. If you specify Quick Resync mode, snapshot data will not be deleted even if the command ends normally. Therefore, even if you specify Quick Resync mode, Quick Resync mode does not take effect.

Deleting XP Snapshot Pairs

Use the command of the RAID Manager or the Pairsplit-S dialog box to delete XP Snapshot pairs.

If you use the RAID Manager to delete XP Snapshot pairs, you need to use the `pairsplit -S` command. By using this command, you can delete only one pair at a time. For details about the `pairsplit -S` command, see the *HP StorageWorks XP RAID Manager User Guide*.

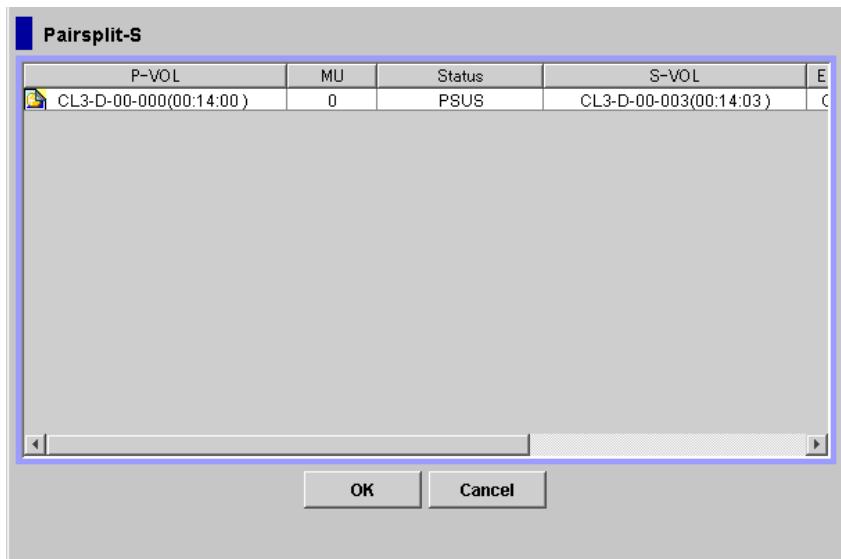
If you use the Pairsplit-S dialog box, you can delete multiple pairs at the same time. You can open the Pairsplit-S dialog box either from XP Business Copy's Pair Operation window or the XP Snapshot window. To select the pairs to be deleted by the port or host group, open the Pairsplit-S dialog box from the Pair Operation window. To select the pairs by pool, open the Pairsplit-S dialog box from the XP Snapshot window.

Deleting XP Snapshot Pairs by Selecting the Pairs per Port

To delete XP Snapshot pairs by selecting the pairs per port:

1. Change the mode of the Remote Web Console to Modify. If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
2. Display the Pair Operation window.
3. In the tree, select the port or host group that contains the XP Snapshot pairs you want to delete. The list of the pairs or volumes is displayed in the volume list.
4. Select and right-click the XP Snapshot pairs you want to delete. A menu is displayed. You cannot delete an XP Business Copy pair and an XP Snapshot pair at the same time.
5. Select the **Pairsplit-S** command from the menu. The Pairsplit-S dialog box (["Pairsplit-S Dialog Box" \(page 90\)](#)) is displayed.
6. Click **OK**. The Pairsplit-S dialog box closes and a list of the XP Snapshot pairs that you are going to delete is displayed in the **Preview** list of the Pair Operation window.
7. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
8. Click **OK**. The confirmation message closes and the deletion of the pair is applied to the storage system.

Figure 23 Pairsplit-S Dialog Box



When you select an XP Snapshot pair and display the Pairsplit-S dialog box, the dialog box displays the following items.

- **Volume list**

Information about the XP Snapshot pairs you are going to delete is displayed.

- **P-VOL:** Information about the P-VOL is displayed in AAA-BB-CCC(XX:YY:ZZ) format.
 - AAA: The port ID (cluster and channel number)
 - BB: The group number of the host group
 - CCC: LU number
 - XX:YY:ZZ: LDKC number:CU number:LDEV number

An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the *HP StorageWorks XP24000/XP20000 External Storage Software User Guide*. For information about XP Thin Provisioning, see the *HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide*.

- **MU:** snapshot ID
- **Status:** status of the XP Snapshot pair
- **S-VOL:** Information about the S-VOL is displayed in AAA-BB-CCC(XX:YY:ZZ) format.
 - AAA: The port ID (cluster and channel number)
 - BB: The group number of host group
 - CCC: LU number
 - XX:YY:ZZ: LDKC number:CU number:LDEV number

An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the *HP StorageWorks XP24000/XP20000 External Storage Software User Guide*. For information about XP Thin Provisioning, see the *HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide*.

- **Emulation:** emulation type

- **Capacity(MB)**: storage capacity of the XP Snapshot pair
- **CLPR(P)**: cache logical partition of the P-VOL
- **CLPR(S)**: cache logical partition of the S-VOL
- **OK button**
Closes the Pairsplit-S dialog box and displays the list of XP Snapshot pairs in the **Preview** list.
- **Cancel button**
Cancels the operation and closes the Pairsplit-S dialog box.

For details about the Pairsplit-S dialog box that will be displayed when you select XP Business Copy pairs, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

Deleting XP Snapshot Pairs by Selecting the Pairs per Pool

To delete XP Snapshot pairs by selecting the pairs per pool:

1. Start the Remote Web Console and display the Remote Web Console main window.
2. Change the mode of the Remote Web Console to Modify. If the mode is already changed to Modify, you can skip this step. For information on how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
3. Display the XP Snapshot window ("XP Snapshot Window" (page 53)) of XP Business Copy.
4. In the tree, select the pool that contains the XP Snapshot pairs you want to delete. The list of the pairs or volumes is displayed in the volume list.
5. Select and right-click the XP Snapshot pairs you want to delete. A menu is displayed.
6. Select the Pairsplit-S command from the menu. The Pairsplit-S dialog box ("Pairsplit-S Dialog Box" (page 90)) is displayed.
7. Click **OK**. The Pairsplit-S dialog box closes and a list of the XP Snapshot pairs that you are going to delete is displayed in the **Preview** list of the XP Snapshot window.
8. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
9. Click **OK**. The confirmation message closes and the deletion of the pair is applied to the storage system.

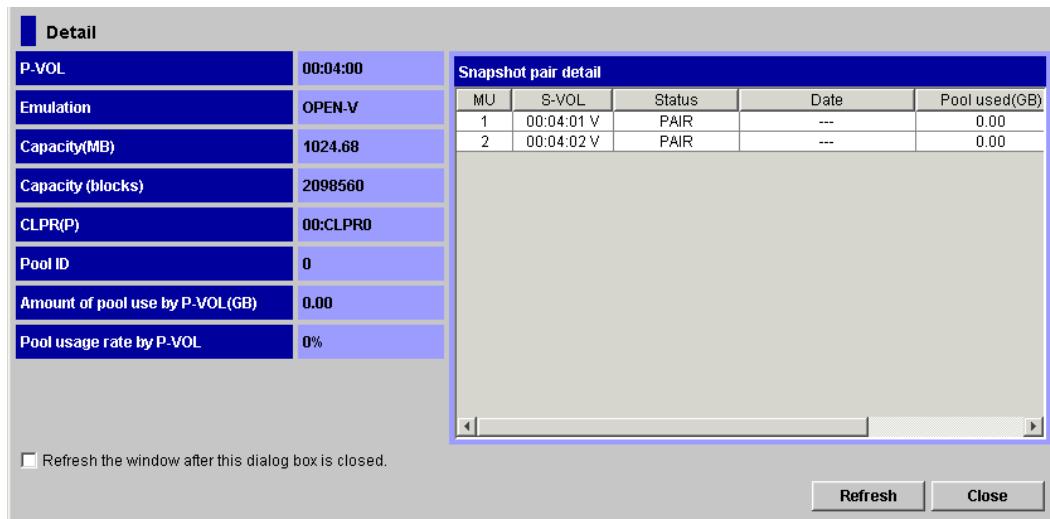
Viewing Detailed Volume and Pair Information

To display the Detail dialog box:

1. Display the XP Business Copy's Pair Operation window.
2. Select and right-click an XP Snapshot pair on the volume list. A menu is displayed.
3. Select the **Detail** command from the menu. The Detail dialog box is displayed.

If you select the **Detail** command in the menu when you are selecting an XP Business Copy pair, the displayed Detail dialog box will be different from that displayed when you select an XP Snapshot pair. For details, see the *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*.

Figure 24 Detail Dialog Box for an XP Snapshot Pair



The Detail dialog box displays the following items.

- **P-VOL**

LDKC number, CU number, and LDEV number of the P-VOL are displayed.

- **Emulation**

Emulation type of the P-VOL is displayed.

- **Capacity(MB)**

Capacity of the P-VOL is displayed. The unit is megabytes (MB).

- **Capacity(blocks)**

The number of blocks used by the P-VOL is displayed.

- **CLPR(P)**

The cache logical partition (CLPR) of the P-VOL is displayed.

- **Pool ID**

The Pool ID of the pool in which the P-VOL is registered is displayed.

- **Amount of pool use by P-VOL(GB)**

The Amount of the pool capacity that is used by the P-VOL is displayed.

- **Pool usage rate by P-VOL**

The Pool usage rate of the P-VOL is displayed.

- **XP Snapshot Pair Detail**

The following information items of snapshot data are displayed.

- **MU:** snapshot ID

- **S-VOL:** LDKC number, CU number, and LDEV number of the S-VOL

- **Status:** status of the XP Snapshot pair

- **Date:** time when the snapshot data is stored in the pool

- **Pool used(GB):** capacity of the pool that is used by the S-VOL

- **Sync.:** consistency rate of the data of the P-VOL and the S-VOL

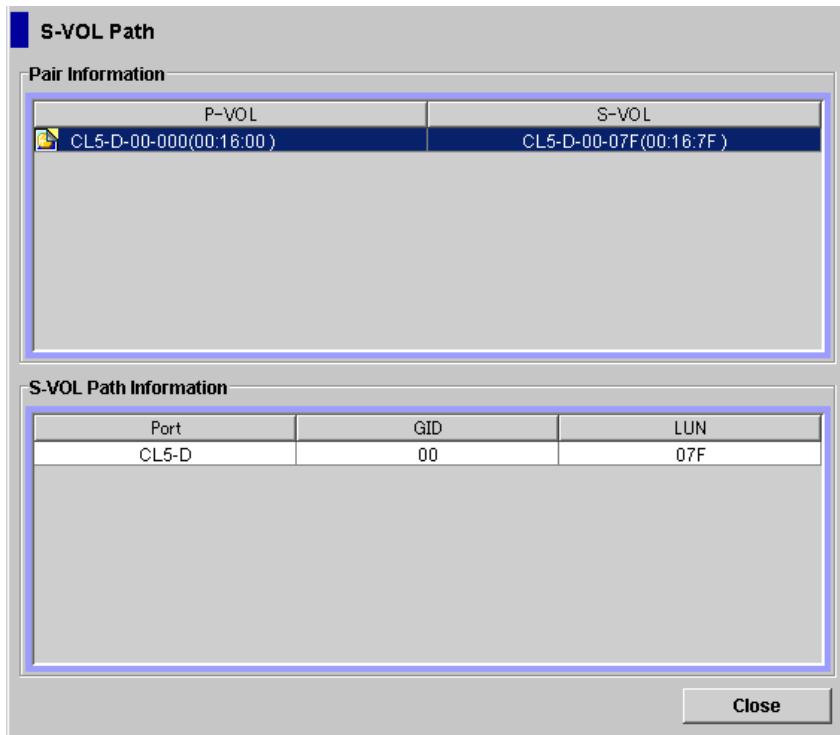
- **CLPR(S)**: cache logical partition (CLPR) of the S-VOL
- **CTG**: consistency group number of the XP Snapshot pair.
When the consistency group is not specified, dotted lines (---) will appear.
- **Refresh the window after this dialog box is closed** check box
If you select the check box, the information displayed in XP Business Copy's Pair Operation window will be updated after the Detail dialog box closes. If you do not select the check box, the information in the Pair Operation window will be the same before and after you close the Detail dialog box.
- **Refresh** button
Updates the information in the Detail dialog box.
- **Close** button
Closes the Detail dialog box.

Viewing S-VOL Path Information

To display the S-VOL Path dialog box:

1. Display the XP Business Copy's Pair Operation window.
2. Select and right-click an XP Snapshot pair on the volume list. A menu is displayed.
3. Select the **S-VOL Path** command from the menu. The S-VOL Path dialog box is displayed.

Figure 25 S-VOL Path Dialog Box



The S-VOL Path dialog box displays the following items:

- The **Pair Information** box displays only information for the paths which are used by the XP Snapshot pairs selected in the Pair Operation window Volume List. **P-VOL** displays the path

information for the P-VOLs and **S-VOL** displays the path information for the S-VOLs in AAA-BB-CCC(XX:YY:ZZ) format.

- AAA: The port ID (cluster name and channel number)
- BB: The group number (G-ID) of the host group
- CCC: LU number
- XX: YY: ZZ: LDKC number: CU number: LDEV number

An LDEV number that ends with a # indicates that the LDEV is an external volume (for example, 00:00:01#). An LDEV number that ends with the letter X indicates that the LDEV is a virtual volume used by XP Thin Provisioning (for example, 00:00:00X). For details regarding external volumes, see the *HP StorageWorks XP24000/XP20000 External Storage Software User's Guide*. For information about XP Thin Provisioning, see the *HP StorageWorks XP24000/XP20000 Thin Provisioning Software User Guide*.

- The **S-VOL Path Information** box displays all the path information, including the alternate paths for the S-VOLs selected in the **Pair Information** box.
 - **Port**: The port ID
 - **GID**: The group number of the host group
 - **LUN**: LU number
- **Close** button

Closes the S-VOL Path dialog box.

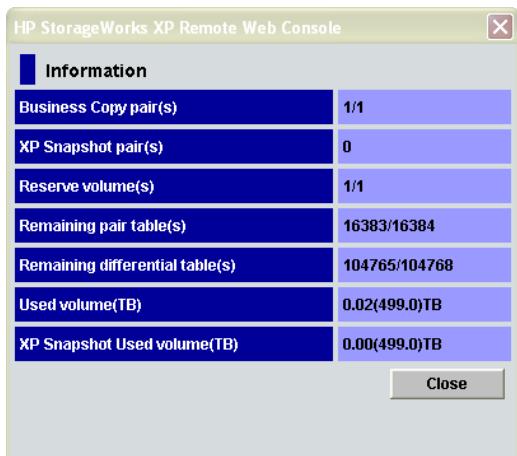
Viewing the Number of Pairs and License Information

The Information dialog box displays information such as the number of pairs in the storage system, the number of reserve volumes, and the license capacity.

To display the Information dialog box:

1. Right-click anywhere on the volume list in XP Business Copy's Pair Operation window. A menu will be displayed.
2. Select the **Information** command in the menu. The Information dialog box will be displayed.

Figure 26 Information Dialog Box



The following information will be displayed in the Information dialog box:

- **XP Business Copy pair(s)**

The number of XP Business Copy pairs will be displayed in the format XXXX / YYYY. XXXX indicates the number of XP Business Copy pairs, and YYYY indicates the total number of XP Business Copy pairs and XP Business Copy for Mainframe pairs.

- **XP Snapshot pair(s)**

The number of XP Snapshot pairs will be displayed.

The maximum number of pairs that can be created in one storage system is 16,384, including migration plans and relationships. Therefore, if XP Snapshot pairs, migration plans of Auto LUN, and relationships of Compatible FlashCopy Version 1 and Compatible FlashCopy Version 2 are created in the same storage system, the maximum number of pairs that you can create may be less than 16,384 minus YYYY. For information on using XP Auto LUN Software, contact HP technical support (see “[Contacting HP](#)” (page 116)).

- **Reserved volume(s)**

The number of reserved volumes of XP Business Copy will be displayed in the format XXXX / YYYY. XXXX indicates the number of reserved volumes of XP Business Copy, and YYYY indicates the total number of reserved volumes of XP Business Copy and XP Business Copy for Mainframe.

Reserved volumes include S-VOLs of XP Business Copy and XP Business Copy for Mainframe pairs.

- **Remaining pair table**

The remaining number of usable pair tables in the storage system will be displayed in the format XXXXX / YYYYYY. XXXXX indicates the remaining number of usable pair table. YYYYYY indicates the maximum number of pair tables. For details about the maximum number of pair tables, see “[Calculating the Maximum Number of Pairs](#)” (page 36).

- **Remaining differential table**

The remaining number of usable differential tables in the storage system will be displayed in the format XXXXXX / YYYYYYY. XXXXXX indicates the remaining number of usable differential table. YYYYYYY indicates the maximum number of differential tables. For details about the maximum number of differential tables, see “[Calculating the Maximum Number of Pairs](#)” (page 36).

- **Used volume (TB)**

License information for XP Business Copy will be indicated in the format X(Y). X indicates license capacity used by XP Business Copy, and Y indicates total license capacity reserved

for XP Business Copy. **Unlimited** will be displayed when there is no limit on the license capacity for XP Business Copy.

- **XP Snapshot Used volume (TB)**

License information for XP Snapshot will be indicated in the format of X(Y). X indicates license capacity used by XP Snapshot, and Y indicates total license capacity reserved for XP Snapshot. **Unlimited** will be displayed when there is no limit on the license capacity for XP Snapshot.

- **Close** button

Closes the Information dialog box.

Displaying the Operation History

The History window ("History Window" (page 51)) displays the history of XP Business Copy operations.

To see the history:

1. Display the History window.

- If you are already displaying another window, click the **History** tab.
- If some of the pairs include LUSE volumes, or if the total number of the following pairs and migration plans is 500 or more in the storage system, you may need to wait for a while until the History window displays operation history:
 - XP Business Copy pairs
 - XP Snapshot pairs
 - XP Business Copy for Mainframe pairs
 - Compatible FlashCopy Version 1 relationships
 - Compatible FlashCopy Version 2 relationships
 - Migration plans of Auto LUN

2. See the **XP Snapshot** list in the lower area of the History window.

3. To change the display order, click a column in the list. The list will be sorted based on the items in the clicked column.

- If there are more than 16,384 records of operations, the list will be divided into multiple pages and only the list which is currently displayed will be sorted.
- If you click the same column again, you can switch the sorting order (Ascending or Descending).

4. If the information in the list is not updated, click **File** and then **Refresh** on the menu bar of the Remote Web Console main window. The list will be updated to the latest information.

As for operations involving the copying process, the History window does not display information about the operations until the copying process starts. If you perform an operation on a pair before the copying process starts, the History window will not display information about the operation.

5. If there are many records of operations, click the scroll button. The list will scroll and you will be able to see the operation history that has not been displayed.

If you click and drag down the frame border which divides the History window into upper and lower panes, you can expand the display area of the list.

6. If there are more than 16,384 records of operations, click **Next**. The list displays subsequent records of operations.
 - If you click **Previous**, the list switches to the previous page.
 - If there are 16,384 or fewer records of operations, you cannot click **Previous** and **Next**.
 - The storage system saves up to 524,288 records of the latest operations.

6 Troubleshooting

This chapter provides troubleshooting information for XP Snapshot.

- “[Procedure to Recover a Blocked Pool](#)” (page 101)
- “[Procedure to Complete the Pool-Related SIMs](#)” (page 102)
- “[Troubleshooting When Using XP RAID Manager](#)” (page 103)

If you have a problem with the Remote Web Console, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide* for troubleshooting information.

[Table 32 \(page 99\)](#) shows problems that might occur when you are using XP Snapshot. The table also describes the causes of the problems and what you should do to solve the problems. If a problem cannot be resolved as described in the table, or if a problem that is not listed occurs, call HP technical support.

Table 32 Troubleshooting for XP Snapshot

Problem	Causes and Solutions
Cannot install XP Snapshot.	<p>Causes:</p> <ul style="list-style-type: none"> • Shared memory for the V-VOL management area is not installed. • Shared memory is not set for the V-VOL management area. • Shared memory for the differential tables is not installed. <p>Solutions:</p> <ul style="list-style-type: none"> • Call HP technical support and check if the shared memory for the V-VOL management area and the differential tables is installed. • Call HP technical support and check if the shared memory for the V-VOL management area is set correctly.
Pool information is not displayed.	<p>Causes:</p> <ul style="list-style-type: none"> • The pool is blocked. <p>Solutions:</p> <ul style="list-style-type: none"> • Implement the measures described in “Procedure to Recover a Blocked Pool” (page 101).
A pool is blocked.	<p>Causes:</p> <ul style="list-style-type: none"> • The pool-VOLs are blocked. <p>Solutions:</p> <ul style="list-style-type: none"> • Implement the measures described in “Procedure to Recover a Blocked Pool” (page 101). In addition, after the problems are solved, you need to complete the SIMs. If you do not complete the SIMs, no new SIM can occur even if a pool is blocked again. For details about the procedure to complete SIMs, see “Procedure to Complete the Pool-Related SIMs” (page 102).
Pool usage rate exceeds the threshold.	<p>Causes:</p> <ul style="list-style-type: none"> • Too much snapshot data is stored in the pool. • Capacity of the pool is insufficient. • Threshold of the pool is too low. <p>Solutions:</p> <ul style="list-style-type: none"> • Delete the snapshot data that is less important or delete the old snapshot data to decrease the usage rate of the pool. • Add some pool volumes to increase the capacity of the pool. • Set a larger value to the threshold of the pool. <p>In addition, after the problems are solved, you need to complete the SIMs. If you do not complete the SIMs, no new SIM can occur even if the usage rate exceeds the threshold again. For details about the procedure to complete SIMs, see “Procedure to Complete the Pool-Related SIMs” (page 102).</p> <p>NOTE: You need unused volumes to add the pool volumes. If there is no unused volume, you need to create new volumes or ask HP technical support to add the hard disks. Therefore, it may take time to solve the problem.</p>
Cannot add pool-VOLs.	<p>Causes:</p> <ul style="list-style-type: none"> • 1,024 pool-VOLs are already set in the pool. • The available pool management block in the V-VOL management area (which is in the shared memory) is insufficient. • The requirements of the pool-VOLs are not fulfilled. <p>Solutions:</p> <ul style="list-style-type: none"> • Add pool-VOLs to another pool. • Initialize the V-VOL management area. • Add the pool-VOLs that fulfill the requirements.

Table 32 Troubleshooting for XP Snapshot (continued)

Problem	Causes and Solutions
Cannot create XP Snapshot pairs.	<p>Causes:</p> <ul style="list-style-type: none">• There are not enough differential tables to create the pairs.• The conditions to create the pair are not fulfilled.• The volumes specified to create the pair are in SMPL(PD) status because the pair is being deleted. <p>Solutions:</p> <ul style="list-style-type: none">• Secure enough differential tables to create the XP Snapshot pairs.• Fulfill the conditions to create the pair and try the pair creation again.• See XP Business Copy's Pair Operation window and verify that the status of the volume changes to SMPL, and then try the pair creation again.• Execute RAID Manager's <code>inqraid</code> command and verify that the volume is not used by XP Snapshot, and then try the pair creation again.
XP Snapshot pairs are not displayed in the volume list.	<p>Causes:</p> <ul style="list-style-type: none">• XP Snapshot pairs are not created.• Displaying XP Snapshot pairs is prohibited by the filtering function. <p>Solutions:</p> <ul style="list-style-type: none">• Create XP Snapshot pairs.• Change the settings in the Display Filter dialog box.
An error occurred while restoring the pair.	<p>Causes:</p> <ul style="list-style-type: none">• A volume is blocked because a failure occurred in the hard disk drive. <p>Solutions:</p> <ul style="list-style-type: none">• Delete the XP Snapshot pair that is blocked, and call HP technical support.
A volume is blocked.	<p>Causes:</p> <ul style="list-style-type: none">• A failure occurred in two or more hard disk drives.• The breaker was turned off once and then the power supply was switched on. <p>Solutions:</p> <ul style="list-style-type: none">• Ask HP technical support to solve the problem.
Trouble occurs on the application software installed in the host computer in order to monitor the volumes.	<p>Causes:</p> <ul style="list-style-type: none">• Access to the volume is rejected. <p>Solutions:</p> <ul style="list-style-type: none">• Terminate the application software which monitors the volumes.• Change all the XP Snapshot pair statuses to PSUS, then start the application software to monitor the volumes. <p>For details about the relations between the pair status and host access, see "Whether Hosts Can Access P-VOL and S-VOL" (page 16).</p>

Table 32 Troubleshooting for XP Snapshot (continued)

Problem	Causes and Solutions
When the host computer tries to access the port, an error occurs and the host cannot access the port.	Causes: <ul style="list-style-type: none">Some ports go offline because the access to the volume on the other port(s) is rejected. Solutions: <ul style="list-style-type: none">Wait for a while, then try the operation again.If the application software is installed in the host to monitor the volume, terminate the application.
When you are operating Remote Web Console, time-out occurs frequently.	Causes: <ul style="list-style-type: none">The load on the Remote Web Console computer is too heavy, so the Remote Web Console computer cannot respond to the SVP.The period of time until time-out occurs is set too short. Solutions: <ul style="list-style-type: none">Wait for a while, then try the operation again.Verify the environment parameter setting for the Remote Web console RMI time-out period. For information about how to set the RMI time-out period, see the <i>HP StorageWorks XP24000/XP20000 Remote Web Console User Guide</i>.

Procedure to Recover a Blocked Pool

When a pool is blocked, you need to recover the following (in the order that they appear):

- pool-VOLs
- pool
- XP Snapshot pairs
- V-VOLs

This section describes the procedures to recover the blocked pool.

- Recovery of the pool-VOLs.** If the pool-VOL is blocked, call HP technical support.
- Recovery of the pool.** To recover the pool:
 - Display the Pool window.
 - Select and right-click the blocked pool in the **Pool** tree in the Pool window. A menu is displayed.
 - Select the **Restore Pool** command from the menu. A confirmation message is displayed asking if it is OK to restore the selected pool.
 - Click **OK**. The icon of the selected pool changes to the icon which indicates the normal status.
 - Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
 - Click **OK**. The confirmation message closes and the restoration of the pool is applied to the storage system.

When there is more than one blocked pool, you may restore all the blocked pools at the same time by executing the following operation after you display the Pool window.

- Select and right-click the **XP Snapshot** icon in the **Pool** tree in the Pool window. A menu is displayed.
- Select the **Restore Pool (s)** command from the menu. A confirmation message is displayed asking if it is OK to restore the pools.
- Click **OK**. The icons of the blocked pools in the **Pool** tree change to the icons which indicate the normal status.

4. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
5. Click **OK**. The confirmation message closes and the restoration of the pools is applied to the storage system.
6. You can check whether the pool is recovered from the blocked status in the Pool window. If Status of the **Pool Information** displays **Normal**, or if the icon in the **Pool** tree indicates the normal status, the blocked pool is restored successfully.

You can also recover the pool by doing one of the following operations:

- Add some pool-VOLs.
- Delete snapshot data to decrease the usage rate of the pool.
- Delete XP Snapshot pairs to decrease the usage rate of the pool.

The usage rate and status of the pool are displayed in the **Pool Information** box in the Pool window. Use this information to decide how many pool volumes to add or which snapshot data to delete.

- **Recovery of the XP Snapshot pair.** When the pool is blocked, the status of all XP Snapshot pairs that have snapshot data stored in the pool changes to PSUE. To recover the PSUE pairs, delete those pairs.
- **Recovery of the V-VOL.** When the V-VOL is blocked, call HP technical support.

Procedure to Complete the Pool-Related SIMs

When the usage rate of the pool exceeds the threshold, or when the pool becomes blocked, the following SIMs (Service Information Messages) will occur.

- When the usage rate of the pool exceeds the threshold: Reference code 601XXX
- When the pool becomes blocked: Reference code 602XXX

XXX indicates the pool ID. For details about the SIM reference codes, call HP technical support. You can reference the SIMs occurring in the storage system through the window of Remote Web Console. For details about the window, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

If you complete a SIM, the status of the SIM changes to completed. After the problem that caused the SIM is solved, complete the SIM and change its status to completed. To complete the SIMs that occur when the usage rate of the pool exceeds the threshold or when the pool becomes blocked:

1. Change the status of the pool whose usage rate exceeds the threshold to normal, and restore the blocked pool to change its status to normal. For information about the solutions when the pool usage rate exceeds the threshold and the pool becomes blocked, see "["Troubleshooting for XP Snapshot" \(page 99\)](#)".
2. Change the mode of the Remote Web Console to Modify. If the mode is already changed to Modify, you can skip this step. For information about how to change the mode, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.
3. Display the Pool window.
4. Select the **SIM Complete Request** check box.
5. Click **Apply**. The confirmation message indicating if it is OK to apply the setting to the storage system is displayed.
6. Click **OK**. The confirmation message closes and the SIM completion process begins. It takes time if there are many SIMs to be completed.

You can check whether the SIMs are completed successfully in the window of Remote Web Console. For details, see the *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*.

Troubleshooting When Using XP RAID Manager

When an error has occurred during an XP Snapshot Pair operation using RAID Manager, see the log displayed on the RAID Manager window or the RAID Manager operation log file to see if you can identify the cause of the error. The RAID Manager operation log file is stored in the following directory by default.

The log file is stored in: /HORCM/log*/curlog/horcmlog_HOST/horcm.log

Where:

- * is the instance number.
- HOST is the host name.

To identify the error code using the log file, follow the procedure below. For more information about RAID Manager, see the *HP StorageWorks XP RAID Manager User Guide*.

1. Open the RAID Manager log file, and find the error code.

Example: 11:06:03-37897-10413- SSB = 0xB901,4A96

Error codes appear on the right of the equal symbol (=). The alphanumeric characters of last four digits on the left of the comma (,) indicates SSB1 (for example, B901), and the right of the comma (,) indicates SSB2 (for example, 4A96).

2. See [Table 33 \(page 104\)](#) and find the meaning of the error code.

For details about the error codes that are not described in [Table 33 \(page 104\)](#), contact HP technical support (see [“Contacting HP” \(page 116\)](#)).

To identify the error code using the log displayed on the RAID Manager window, follow the procedure below. For more information about RAID Manager, see the *HP StorageWorks XP RAID Manager User Guide*.

1. Find the error code from the logs displayed on the RAID Manager window.

[Figure 27 \(page 103\)](#) shows an example of a log displayed on the RAID Manager window.

Figure 27 Example of a Log Displayed on the RAID Manager Window

It was rejected due to SKEY=0x05, ASC=0x20,SSB=0xB9E1,0xB901 on Serial#(64015)



Error codes appear on the right of SSB=. The alphanumeric characters of last four digits on the left of the comma (,) indicates SSB1 (for example, B9E1), and the alphanumeric characters of last four digits on the right of the comma (,) indicates SSB2 (for example, B901).

2. See [Table 33 \(page 104\)](#) and find the meaning of the error code.

For details about the error codes that are not described in [Table 33 \(page 104\)](#), contact HP technical support (see [“Contacting HP” \(page 116\)](#)).

Table 33 Cause of Error and the Result of RAID Manager Command (SSB)

SSB1	SSB2	RAID Manager Command	Cause of Error
B901	9685	paircreate	Because of the shortage of the pair tables, XP Snapshot pair cannot be created.
B9A8	9686	paircreate	Because of the shortage of the differential tables, XP Snapshot pair cannot be created.
B9A9	9700	paircreate	Since the pool is not available, XP Snapshot pair cannot be created.
B9AD	9702	paircreate	When you create multiple XP Snapshot pairs by specifying multiple S-VOLs for one P-VOL, you specified the pool ID that is different from the pool ID used by the pairs that are already created. Therefore, an XP Snapshot pair cannot be created.
B9AE	9703	paircreate	Since the volume you specified as the P-VOL is already used by another XP Snapshot S-VOL, the pair cannot be created.
	9704	paircreate	Since the volume you specified as the S-VOL is already used by another XP Snapshot P-VOL, the pair cannot be created.
	9705	paircreate	Since the volume you specified as the S-VOL is already used by another XP Snapshot S-VOL, the pair cannot be created.
	9706	paircreate	Since the specified XP Snapshot ID is already used by another XP Snapshot pair, the pair cannot be created.
	9707	paircreate	Since the capacity of the pair exceeds the licensed capacity, the pair cannot be created.
	9718	All commands	The command ended abnormally because the command other than the paircreate command was issued for the volume in the pair other than the XP Snapshot pair. This error also may be reported when the command is executed by specifying an unsupported parameter.
	9719	All commands	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			The command ended abnormally because the pair is in the status that the corresponding command is not accepted at present. This error also may be reported when the command is executed with specifying an unsupported parameter.
	971a	paircreate	Since the capacity of shared memory is insufficient, the pair cannot be created.
	971b	paircreate	Since the attribute of the specified pool is other than XP Snapshot, an XP Snapshot pair cannot be created.
	971f	pairresync - restore	Since the volume you specified as the P-VOL has an S-VOL Disable attribute, an XP Snapshot pair cannot be restored.
	9720	All commands	Any errors have occurred because of the XP Snapshot operation.
	9721	paircreate pairsplit pairresync pairresync - restore	Since either XP Snapshot or XP Business Copy Software is not installed, the command ends abnormally.
	9723	All commands	Because of no additional shared memory (FCV2, TPF, Extention1), the command ends abnormally.
	9724	All commands	Because of no additional shared memory (more than XP1), the command ends abnormally.
	9725	All commands	Since the LDEV number of the volume you specified as the P-VOL is beyond the specified range, the command ends abnormally.
	9726	All commands	Since you specified the unmounted volume as the XP Snapshot P-VOL, the command ends abnormally.
	9727		Since you specified the blocked volume as the XP Snapshot P-VOL, the command ends abnormally.

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
		paircreate, pairsplit, pairresync, pairresync - pairresync -	
	9728	paircreate, pairsplit, pairresync, pairresync - pairresync -	Since you specified the volume that is in process of formatting as the XP Snapshot P-VOL, the command ends abnormally.
	9729	paircreate, pairsplit, pairresync, pairresync - pairresync -	Since you specified the volume whose emulation type is other than OPEN-V as the XP Snapshot P-VOL, the command ends abnormally.
	972a	paircreate	Since the volume you specified as the XP Snapshot P-VOL has the command device setting, the pair cannot be created.
	972c	paircreate	Since the capacity of the volume you specified as the XP Snapshot P-VOL exceeds the supported size (4TB), the pair cannot be created.
	972e	paircreate	Since the capacity of the volume you specified as the XP Snapshot S-VOL exceeds the supported size (4TB), the pair cannot be created.
	972f	paircreate	Since you specified a V-VOL as the XP Snapshot P-VOL, the pair cannot be created.
	9730	paircreate	Since you specified a pool-VOL as the XP Snapshot P-VOL, the pair cannot be created.
	9731	pairresync - restore	When XP Snapshot P-VOL and XP Continuous Access Software P-VOL share the volume, the status of the XP Continuous Access pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.
	9732	pairresync - restore	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			When XP Snapshot P-VOL and XP Continuous Access Journal Software P-VOL share the volume, the status of the XP Continuous Access Journal pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.
	9733	pairresync - restore	Since XP Snapshot P-VOL and XP Continuous Access S-VOL share the volume, the XP Snapshot pair cannot be restored.
	9734	pairresync - restore	Since XP Snapshot P-VOL and XP Continuous Access Journal S-VOL share the volume, the XP Snapshot pair cannot be restored.
	9735	paircreate	Since you specified XP Continuous Access Journal'S journal volume as the XP Snapshot P-VOL, the pair cannot be created.
	9736	paircreate pairsplit, pairresync, pairresync - restore	Since the LUSE volumes you specified for the P-VOL and S-VOL do not have the same structure, the command ends abnormally.
	973a	paircreate	Since you specified the volume with the VMA setting as the XP Snapshot P-VOL, the pair cannot be created.
	973b	All commands	Since the LDEV number of the volume you specified as the S-VOL is beyond the specified range, the command ends abnormally.
	973c	All commands	Since you specified the unmounted volume as the XP Snapshot S-VOL, the command ends abnormally.
	973d	paircreate pairsplit, pairresync, pairresync - restore	Since you specified the blocked volume as the XP Snapshot S-VOL, the command ends abnormally.
	973e		Since you specified the volume that is in process of formatting as the XP Snapshot S-VOL, the command ends abnormally.

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
		paircreate pairsplit, pairresync, pairresync - restore	
	973f	paircreate pairsplit, pairresync, pairresync - restore	Since you specified the volume whose emulation type is other than OPEN-V as the XP Snapshot S-VOL, the command ends abnormally.
	9740	paircreate	Since the volume you specified as the XP Snapshot S-VOL has the command device setting, the pair cannot be created.
	9742	paircreate	Since you specified an external volume as the XP Snapshot S-VOL, the pair cannot be created.
	9745	paircreate	Since you specified the volume other than V-VOLs as the XP Snapshot S-VOL, the pair cannot be created.
	9746	paircreate	Since you specified a pool-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	9747	paircreate	Since you specified XP Continuous Access P-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	9748	paircreate	Since you specified XP Continuous Access S-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	9749	paircreate	Since you specified XP Continuous Access Journal data volume or journal volume in the intermediate site of 3DC cascading configuration as the XP Snapshot S-VOL, the Snapshot pair cannot be created.
	974a	paircreate	Since you specified XP Continuous Access Journal P-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	974b	paircreate	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			Since you specified XP Continuous Access Journal S-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	974c	paircreate	Since you specified XP Continuous Access Journal journal volume as the XP Snapshot S-VOL, the pair cannot be created.
	974f	All commands	Since the volume you specified as the S-VOL has an S-VOL Disable attribute, the command ends abnormally.
	9750	paircreate	Since you specified the volume with the VMA setting as the XP Snapshot S-VOL, the pair cannot be created.
	9752	paircreate, pairsplit, pairresync, pairresync - restore	Since the Max LBA size of the volumes you specified as the XP Snapshot P-VOL and S-VOL is different, the command ends abnormally.
	9753	paircreate, pairsplit, pairresync, pairresync - restore	Since the number of slots of the volumes you specified as the XP Snapshot P-VOL and S-VOL is different, the command ends abnormally.
	9754	paircreate,	Since you specified the XP Thin Provisioning V-VOL as the XP Snapshot S-VOL, the pair cannot be created.
	9756	All commands	Since you specified the XP Business Copy reserved volume as the XP Snapshot P-VOL, the command ends abnormally.
	9757	All commands	Since you specified the XP Auto LUN Software source volume as the XP Snapshot P-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	9758	All commands	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			Since you specified the XP Auto LUN target volume as the XP Snapshot P-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	9759	All commands	Since you specified the XP Auto LUN reserved volume as the XP Snapshot P-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	975a	All commands	Since you specified the XP Business Copy P-VOL as the XP Snapshot S-VOL, the command ends abnormally.
	975b	All commands	Since you specified the XP Business Copy S-VOL as the XP Snapshot S-VOL, the command ends abnormally.
	975c	All commands	Since you specified the XP Business Copy reserved volume as the XP Snapshot S-VOL, the command ends abnormally.
	975d	All commands	Since you specified the XP Auto LUN source volume as the XP Snapshot S-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	975e	All commands	Since you specified the XP Auto LUN target volume as the XP Snapshot S-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	975f	All commands	Since you specified the XP Auto LUN reserved volume as the XP Snapshot S-VOL, the command ends abnormally. For information about using XP Auto LUN, contact HP technical support (see " Contacting HP " (page 116)).
	9763	paircreate	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			The XP Snapshot pair cannot be created for any of the following reasons: <ul style="list-style-type: none">• The shared memory is not increased.• Initialization is in process.
	976a	paircreate	Unavailable parameter (unsupported parameter) is specified in the command.
	976c	pairsplit	Since the command was executed with the PSUE option, the snapshot data cannot be stored.
	976e	pairsplit	When an XP Snapshot P-VOL and XP Continuous Access S-VOL share the volume, the status of the XP Continuous Access pair is COPY. Therefore, the snapshot data cannot be stored.
	976f	pairsplit	When XP Snapshot P-VOL and XP Continuous Access Journal S-VOL share the volume, the status of the XP Continuous Access Journal pair is COPY. Therefore, the snapshot data cannot be stored.
	9771	paircreate	Since you specified XP Continuous Access Journal delta resync pair volume as the XP Snapshot P-VOL, the XP Snapshot pair cannot be created.
	9772	paircreate	Since you specified XP Continuous Access Journal delta resync pair volume as the XP Snapshot S-VOL, the XP Snapshot pair cannot be created.
	9774	paircreate	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the MU number you specified for the XP Snapshot pair is already used by the XP Business Copy pair. Therefore, the XP Snapshot pair cannot be created.
	9776	paircreate	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the XP Business Copy P-VOL you specified for the XP Snapshot P-VOL has consistency group settings. Therefore, the XP Snapshot pair cannot be created.
	9777	paircreate	When the XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, you specified MU number zero (0) for the XP Snapshot P-VOL. Therefore, the XP Snapshot pair cannot be created.
	9778	paircreate	When the XP Snapshot P-VOL and S-VOL share the volume, the XP Business Copy S-VOL you specified for the XP Snapshot P-VOL has consistency group settings. Therefore, the XP Snapshot pair cannot be created.
	977a	paircreate, pairsplit	When the XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the XP Business Copy pair was in the process of resynchronization. Therefore, the command ends abnormally.
	977b	paircreate, pairsplit	When XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, the status of the XP Business Copy pair is other than PSUS. Therefore, the command ends abnormally.
	977c	pairresync - restore	When XP Snapshot P-VOL and XP Business Copy P-VOL share the volume, the status of the XP Business Copy pair is other than PSUS or PSUE. Therefore, the XP Snapshot pair cannot be restored.
	977d	pairresync - restore	When XP Snapshot P-VOL and XP Business Copy S-VOL share the volume, the status of the XP Business Copy pair is other than PSUS. Therefore, the XP Snapshot pair cannot be restored.
	977e	pairsplit	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			Since the pool or the pool-VOL is blocked, the snapshot data cannot be stored.
	9783	pairresync, restore	The XP Snapshot pair cannot be restored for any of the following reasons: <ul style="list-style-type: none">• The snapshot data of the XP Snapshot pair for restoration is being stored per consistency group.• The P-VOL of the XP Snapshot pair for restoration is used as the P-VOL of another XP Snapshot pair, and the snapshot data of the latter XP Snapshot pair is being stored per consistency group.
	9786	paircreate, pairsplit, pairresync, pairresync - restore	Since quorum disks are specified as P-VOLs of Snapshot pairs, the command ends abnormally.
	9787	paircreate, pairsplit, pairresync, pairresync - restore	Since quorum disks are specified as S-VOLs of Snapshot pairs, the command ends abnormally.
	978a	paircreate	Since one of the following cases occurred, the XP Snapshot pair cannot be created by specifying the consistency number. <ul style="list-style-type: none">• The specified consistency group number is in use for XP Business Copy.• The number of pairs has already exceeded the maximum number of pairs that can be created for one consistency group.• The pair that uses the same P-VOL exists already in the specified consistency group.
	978b	paircreate	

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
			The XP Snapshot pair cannot be created because the specified consistency group number is out of the range of the number that can be specified.
	978c	pairsplit	The snapshot data cannot be stored because the XP Continuous Access asynchronous pair status is other than PSUS or PSUE when XP Snapshot (P-VOL) and XP Continuous Access asynchronous (S-VOL) share the volume.
	978e	paircreate	The XP Snapshot pair for which the consistency group is specified cannot be created because the P-VOL or S-VOL of the XP Business Copy pair is specified as the P-VOL of the XP Snapshot pair.
	9790	paircreate	The XP Thin Provisioning virtual volume, which is undergoing capacity expansion, is specified as the XP Snapshot P-VOL. Therefore, the XP Snapshot pair cannot be created.
	9793	paircreate	The XP Snapshot pair cannot be created because the XP Thin Provisioning V-VOL that is discarding zero data is specified as a P-VOL of the XP Snapshot pair.
	97a2	paircreate pairsplit pairresync pairresync -restore	The command ended abnormally because the specified S-VOL used two mirrors in a 3DC multi-target or 3DC cascade configuration, which is a delta resync configuration consisting of three XP Continuous Access Journal sites.
	97a3	paircreate pairsplit pairresync pairresync -restore	The command ended abnormally because the specified S-VOL used two mirrors in a 3DC multi-target or 3DC cascade configuration, which is a delta resync configuration consisting of three XP Continuous Access Journal sites.
	B912		

Table 33 Cause of Error and the Result of RAID Manager Command (SSB) (continued)

SSB1	SSB2	RAID Manager Command	Cause of Error
		paircreate pairsplit pairresync	The XP Snapshot pair operation failed because the specified S-VOL is wrong.
	B9A7	All commands	The consistency group information cannot be obtained because the XP Snapshot is not installed.

7 Support and other resources

Contacting HP

HP technical support

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/e-updates>

After registering, you will receive email notification of product enhancements, new driver versions, firmware updates, and other product resources.

Documentation Feedback

HP welcomes your feedback.

To make comments and suggestions about product documentation, send a message to
storagedocsFeedback@hp.com.

Related information

The following documents and website provide related information:

- *HP StorageWorks XP24000/XP20000 Disk Array Owner Guide*
- *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*
- *HP StorageWorks XP24000/XP20000 Remote Web Console User Guide*
- *HP StorageWorks XP24000/XP20000 Business Copy Software User Guide*
- *HP StorageWorks XP24000/XP20000 Continuous Access Software User Guide*
- *HP StorageWorks XP24000/XP20000 Continuous Access Journal Software User Guide*
- *HP StorageWorks XP24000/XP20000 LUN Expansion User Guide*
- *HP StorageWorks XP24000/XP20000 Virtual LVI/LUN (VLL) and Volume Shredder User Guide*
- *HP StorageWorks XP24000/XP20000 Data Retention Utility User Guide*
- *HP StorageWorks XP24000/XP20000 Performance Monitor User Guide*
- *HP StorageWorks XP24000/XP20000 Auto LUN Software User Guide*

- *HP StorageWorks XP24000/XP20000 Performance Control User Guide*
- *HP StorageWorks XP RAID Manager User Guide*

You can find these documents on the HP Manuals website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Software** and then select a product.

Websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- <http://www.hp.com/support/manuals>
- <http://www.hp.com/storage/spock>

Conventions for storage capacity values

HP XP storage systems use the following values to calculate physical storage capacity values (hard disk drives):

- 1 KB (kilobyte) = 1,000 bytes
- 1 MB (megabyte) = $1,000^2$ bytes
- 1 GB (gigabyte) = $1,000^3$ bytes
- 1 TB (terabyte) = $1,000^4$ bytes
- 1 PB (petabyte) = $1,000^5$ bytes

HP XP storage systems use the following values to calculate logical storage capacity values (logical devices):

- 1 KB (kilobyte) = 1,024 bytes
- 1 MB (megabyte) = $1,024^2$ bytes
- 1 GB (gigabyte) = $1,024^3$ bytes
- 1 TB (terabyte) = $1,024^4$ bytes
- 1 PB (petabyte) = $1,024^5$ bytes
- 1 block = 512 bytes

Typographic conventions

Table 34 Document conventions

Convention	Element
Medium blue text: Table 34 (page 117)	Cross-reference links and email addresses
Medium blue, underlined text: http://www.hp.com	Website addresses
Bold text	<ul style="list-style-type: none"> • Keys that are pressed • Text typed into a GUI element, such as into a box • GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
<i>Italic</i> text	Text emphasis

Table 34 Document conventions (continued)

Convention	Element
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<i>Monospace, italic text</i>	<ul style="list-style-type: none">• Code variables• Command variables
Monospace, bold text	Emphasized monospace text
.	Indication that the example continues.
.	
.	
WARNING!	An alert that calls attention to important information that if not understood or followed can result in personal injury.
CAUTION:	An alert that calls attention to important information that if not understood or followed can result in data loss, data corruption, or damage to hardware or software.
IMPORTANT:	An alert that calls attention to essential information.
NOTE:	An alert that calls attention to additional or supplementary information.
TIP:	An alert that calls attention to helpful hints and shortcuts.

Glossary

3

3DC Three data center.

C

CCI Command control interface. An HP RAID manager.
CLPR Cache logical partition.
CLPR(P) Cache logical partition of the P-VOL.
CLPR(S) Cache logical partition of the S-VOL.
CTG Consistency group.
CU Control unit.
CV Custom sized volume.
CYL Cylinder.

D

DKC Disk controller.
DKCMAIN Disk controller main.

F

FC Fibre Channel. A network technology primarily used for storage networks.

G

G-ID Host group ID.

L

LD, LDEV Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-9). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is also known as *term volume*.
LDKC Logical disk controller.
LUN Logical unit number.
LUSE Logical Unit Size Expansion. The LUSE feature is available when the HP StorageWorks LUN Manager product is installed, and allows a LUN, normally associated with only a single LDEV, to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage.
LVI Logical volume or image (for example, 3390-3R).

M

Mng. Management
MU Mirror unit.

O

OPEN-x A general term describing any one of the supported OPEN emulation modes (for example, OPEN-E). There are two types of OPEN-x devices: legacy OPEN-x devices with a fixed size (such as, OPEN-3, OPEN-8, OPEN-9, OPEN-E), and OPEN-V, which has a variable size and is a CVS based volume.

P

P-VOL	Primary volume.
PDEV	Physical device.
PFUL	PAIR closing full status.
PFUS	PSUS closing full status.
PSUE	Pair suspended-error.
PSUS	Pair suspended-split.

R

RMI	Remote method invocation.
------------	---------------------------

S

S-VOL	Secondary or remote volume. The copy volume that receives the data from the primary volume.
SATA	Serial Advanced Technology Attachment.
SIM	Service information message.
SLPR	Storage logical partition.
SMPL	Simplex.
SSB	Sense byte.
SSD	Solid state disk.
SVP	Service processor. A computer built into a disk array. The SVP, used only by an HP service representative, provides a direct interface to the disk array.

V

V-VOL	Virtual volume.
VDEV	Virtual device.
VLL	Virtual LVI/LUN.
VMA	Volume management area.

Index

A

access attribute, 27
Auto LUN, 27

C

calculating the maximum number of pairs, 36
Change Pool Information dialog box, 72
command device, 35
components, 8
conventions
 storage capacity values, 117
COPY, 15
Copy Threshold option, 25
COPY(RS), 15
Create V-VOL wizard dialog box (1), 77
Create V-VOL wizard dialog box (2), 79
Create V-VOL wizard dialog box (4), 82

D

Data Retention Utility, 27
defining pool capacity, 40
Detail dialog box, 92
Display Filter dialog box, 68
document
 related documentation, 116
documentation
 HP website, 117
 providing feedback, 116

E

External Storage, 47
external volumes, 47

H

help
 obtaining, 116
History window, 51
HP
 technical support, 116
HP-UX, 11

I

Information dialog box, 95
installing, 42
installing and uninstalling, 42

L

license requirements, 35

M

menu
 Pair Operation window (volume list), 49

N

New Pool dialog box, 71

New V-VOL Group dialog box, 76

number of differential tables
 calculating the number of XP Snapshot pairs, 36

O

optional requirements, 35

P

Pair Operation window, 45
pair table
 calculating the number of XP Snapshot pairs, 39
Pairsplit-S dialog box, 90
performance considerations, 40
Pool window, 56
Preparing for XP Snapshot Operations, 33
Preview list, 50
PSUE, 16
PSUS, 15

R

RAID level, 33
related information, 116
Remote Web Console main window, 43
replacing the microcode offline, 41
requirements for maintaining XP Snapshot, 41
requirements for RAID Manager, 35

S

S-VOL Path dialog box, 93
shared memory, 35
shared memory requirements, 35
SMPL, 15
SMPL(PD), 15
snapshot data, 12
starting , 42
storage capacity values
 conventions, 117
storage systems
 supported models, 6
Subscriber's Choice, HP, 116
switching off the power supply, 41
system requirements, 33

T

technical support, 117
 HP, 116
troubleshooting, 98

U

uninstalling, 42
using external volumes as pool-VOLs, 41

V

V-VOL window, 63
virtual volume management area
 calculating the number of XP Snapshot pairs, 37

volume list, 46

volume requirements, 33

W

websites

HP, 117

HP Subscriber's Choice for Business, 116

product manuals, 117

X

XP Business Copy, 27

XP Continuous Access, 30

XP Continuous Access Journal, 30

XP Snapshot Software license requirements, 35

XP Snapshot window, 53

XP Thin Provisioning, 32